HODDER's
ARITHMETICK:
OR, THAT
Neceſſary Art
Made moſt Eaſie.

Being Explained in a Way familiar to the Capacity of any that deſire to learn it in a little Time.

By James Hodder, *Writing-Maſter.*

The One and twentieth Edition, Reviſed, Augmented, and above a Thouſand Faults Amended, by Henry Moſe, *late Servant and Succeſſor to the Author.*

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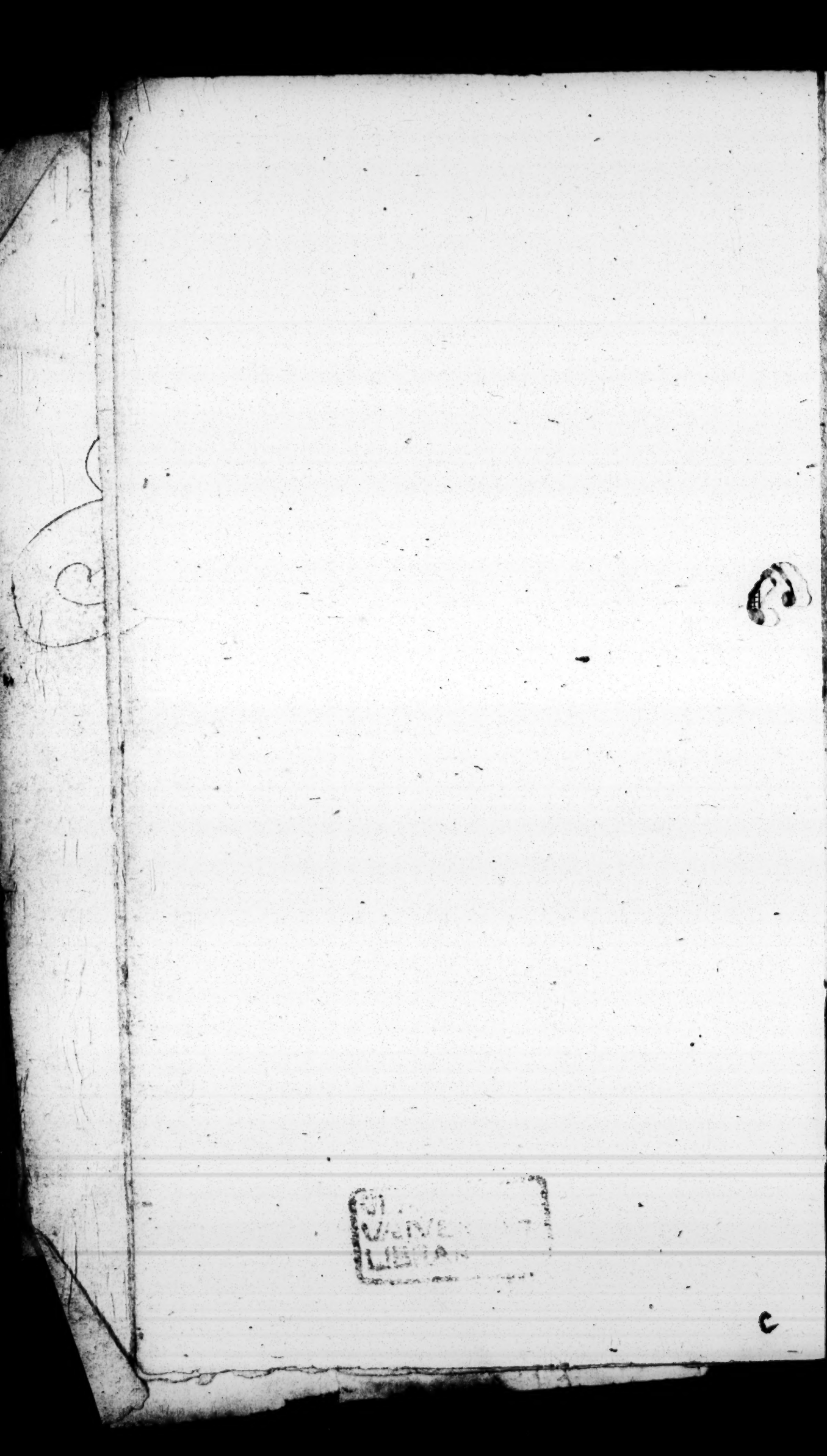


TO HIS

REALLY LOVING

AND

Most Worthily Honoured

FRIEND,

JOSIAS DEWYE,

Merchant *and* Citizen

OF

LONDON:

James Hodder,

In token of True Gratitude for Unmerited Kindnesses,

HUMBLY DEDICATETH

THIS

Manual of Arithmetick.

TO THE READER.

HAving for ſundry Years kept a Writing School in this City, and thereby gained ſome Experience in that commendable Art, I thought good heretofore to publiſh ſomewhat thereof.

And now for the better compleating of Youth as to Clerkſhip and Trades, I am induc'd to publiſh this ſmall Treatiſe of Arithmetick, which, tho' it be dedicated more particularly to my much honoured Friend, yet being aſſured he can be content that others ſhould partake of the Benefit thereof, I make bold thus to communicate it.

I need not go about to ſpeak any thing in Praiſe of Arithmetick, but ſhall willingly ſubmit what is here treated of, to the candid Cenſure of the moſt judiciouſly skilful.

And as I ſhall condemn no Man's Diligence in what he hath formerly done, ſo I think none will blame my Endeavours at the preſent; for tho' I know it is impoſſible to pleaſe every Man, and therefore am not ſollicitous how to do it; yet according to the Ability which God hath given me, I have

To the Reader.

I have laboured to make a more clear Discovery of some Intricacies in this Art, than to my knowledge hath hitherto been. Which perhaps may not seem to be set out in so gallant a Dress as some others; but I dare aver to be done with as much Plainness, Facility, and Shortness as any that I have yet observed.

Thus, not fearing, gentle Reader, lest any Man should scorn my Labours, because I seem to undervalue them, by letting others have the Use, Profit, and Pleasure thereof at so small a Rate, I refer my self and them to thy Consideration; and if after Perusal and Trial made, thou kindly accept what I lovingly offer, it shall abundantly satisfie him that is devoted to serve God, and profit others in his Calling, and desires to remain,

Ready to pleasure thee,

whether known or unknown to

James Hodder.

The

The Corrector to the Reader.

SInce this Aritmetick came out, it hath ſufficiently demonſtrated to the World its Utility and facile Method; and therefore needs no further Commendation than what the Learner (thro' its eaſie Inſtructions) may have cauſe to give it.

And yet notwithſtanding the World hath been fully ſatisfied with the Method thereof, many have been laid under great Diſcouragements (ſome thro' Ignorance blaming the Author) for Multitudes of Faults that have crept in by the neglect of the Preſs, and ſome by pretending to a Perfection in the ſaid Art, before they have attained to it by a Practical Habit.

Now (*Courteous Reader*) thou maiſt chearfully go on, all its former Errors being purged from it, and ſome more Light given to it, being augmented in ſeveral Places where Occaſion (for thy ſake) did require: And that it may anſwer thy Expectations, is the Deſire of him who is a Lover of Ingenious Arts.

HENRY MOSE.

To

To my Ingenious Friend Mr. *Henry Moſe*, upon his Amendments to Mr. *James Hodder*'s Arithmetick.

THis Critick Age excludes Things obſolete;
Now nothing takes wanting a Dreſs compleat.
Beauty, tho' unadorn'd, is Beauty ſtill,
Enrich'd with Splendour, captivates each Will.
So he that wou'd careſs this knowing Age,
And means t'appear in Print upon the Stage,
(Ev'n in this Harveſt time, when Learning, Arts,
And Wits are ripe, and the ſublimeſt Parts
Are now arriv'd at what they can aſpire,
At which Ages to come may well admire)
Muſt emulate what hath been done before,
And muſter thoſe Acquirements which in ſtore
Lay dormant. This thy Pen hath fully done;
Th' haſt added to his Fame, and to thy own:
For amplifying his elab'rate Piece,
Multiplies thy Worth, not ſubtracting his.
Imbelliſhing the Work, is to create
A laſting Progeny in deſpite of Fate.
The Author's Mantle doth envelop thee,
And when the future grateful Age ſhall ſee,
That by Accompliſhments thou doſt inherit
A double Portion of thy Maſter's Spirit,
Poſterity ſhall make account it owes
To Hodder's *Memory, but much more to* Moſe.

S. HODDER.

A TABLE ſhewing the Contents of this Book.

Chap.

Hodder's Arithmetick.

CHAP. I.

The Definition of Number.

A Number is a multitude of Units put together, as 2, 3, 4, 5, 6, &c. Therefore an Unit is properly no Number, but the Original or Beginning of Number; for it being multiplied or divided by it ſelf, is reſolved again into it ſelf, without any Increaſement or Decreaſement.

NUMERATION.

Numeration is that Part of Arithmetick whereby one may rightly value, expreſs, and write any Number or Sum propounded.

To the attaining whereof, obſerve, that all Numbers are expreſs'd by theſe Characters following, whoſe ſimple Value by

themſelves conſider'd, you may here take notice of.

one, two, three, four, five, ſix, ſeven, eight, nine, cypher.

1 2 3 4 5 6 7 8 9 0

The Cypher ſerveth to make up the number of Places, but of it ſelf ſignifieth nothing.

Every Figure hath two Values, whereof one is always certain, and hath its own Signification; but the other is uncertain, by reaſon of the uncertainty of the Place where it may happen to ſtand.

A Place we commonly call a Space in which a Figure ſtandeth; and look how many Figures there are, ſo many Places there are by which they are valued.

Every Figure in the firſt Place ſimply betokeneth it ſelf; but in the ſecond Place, which is towards the left Hand, it is ten times ſo much as it was in the Place before, and ſo increaſeth its Value according to its Place, as you may ſee in the Table following.

Nu-

Numeration Table.

C. Millions.	X. Millions.	Millions.	C. Thousands.	X. Thousands.	Thousands.	Hundreds.	Tens.	Units.
9	8	7.	6	5	4.	3	2	1

The first Place.

9	8	7.	6	5	4.	3	2	1	987 *mil.* 654 *thou.* 321
	9	8.	7	6	5.	4	3	2	98 *mil.* 765 *thou.* 432
		9.	8	7	6.	5	4	3	9 *mil.* 876 *thou.* 543
			9	8	7.	6	5	4	987 *thousand* ——— 654
The				9	8.	7	6	5	98 *thousand* ——— 765
left hand					9.	8	7	6	9 *thousand* ——— 876
						9	8	7	——— 987
							9	8	——— 98
								9	——— 9

Which you muſt read beginning from the laſt Place on the left hand, and proceeding to the firſt at the right, on this manner, with the Nine hundred eighty ſeven Millions, ſix hundred fifty four thouſand, three hundred twenty one.

And for the better underſtanding of the Table, obſerve, that the firſt Figure next the right hand is the Place of Units, and ſignifies but his own ſingle Value; as the Figure

of 1 but one, 2 but two, 3 but three, *&c.* But where two or more Figures are joined together, the Figure in the ſecond Place towards the left hand betokeneth its own ſingle Value ten times; and ſo in the third Place ſignifies his own Value an hundred times; in the fourth Place, a thouſand times.

Example. 6 in the fourth Place is ſix thouſand, 6 in the third Place is ſix hundred, 6 in the ninth Place is ſix hundred Millions.

And thus you ſee the Value of the Figure is according to the Place it ſtandeth in.

The Names of the Places therefore you muſt be ſure to get by heart.

To help you in the expreſſing of great Numbers, you may make a Period or Prick with your Pen between every three Figures, beginning at the right hand; as in this Example.

123. 456. 789. Here you ſee is one hundred twenty three, four hundred fifty ſix, ſeven hundred eighty nine. Thus you muſt expreſs all Figures: But to know the Value of them, you muſt begin at the right-hand, and reckon towards the left, according to the precedent Table, and you will find

find them to be one hundred twenty three millions, four hundred fifty six thousand, seven hundred eighty nine.

There are three sorts of Numbers:

1. A Digit.
2. An Article.
3. A Mixt or Compound.

All Numbers not exceeding the nine Units are call'd Digits; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

Articles are Numbers consisting of a Digit and a Cypher; as 10, 20, 30, 40, 50, 60, *&c.*

A Compound is a Number consisting of both; as 13, 14, 15, 16, 17, *&c.*

CHAP. II.

ADDITION.

Without the lesser Denominations.

BEfore I begin to acquaint you with the Working of any of the Rules following, I shall (all along in their proper Places) first shew you the Nature and Meaning of the Rules, and secondly the Manner of their Working.

What Addition teacheth.

Addition teacheth you to add two or more Sums together, to make them one whole or total Sum, *viz.*

Example.

Received at ſeveral times theſe particular Sums following:

At one time	341
At another time	158
More	217
More	596
More	179
I deſire to know how much was received in all.	1491

I. For the working of this, and all others of this kind, you muſt begin with the firſt or lowermoſt Figure at your right hand, ſaying, 9, 6, 7, 8, and 1, makes 31; then ſet down the 1 in a Line underneath, and carry the 3 unto the next Place, where 7, 9, 1, 5, 4, and 3 that I carried make 29, which 9 ſet down, and carry the 2 unto the next Place towards your left hand, ſaying, 1, 5, 2, 1, 3, and 2 that I brought, make 14, which ſet down. So that you ſee all the Particulars do make 1491.

A General Rule.

For Sums of one Denomination in Addition, obſerve to ſet down all that is above Ten or Tens, and under Ten: and for every Ten carry One to the next Place, until you come to the laſt, which muſt always be ſet down, as in the former Example and this following appeareth.

2734
3945
6542
5763
9278
1712

29974

Here I think it not amiſs to adviſe you to be ſure, for your clearer working, to ſet down the Figures of every Rank in a ſtreight Line under one another; as you ſee in the foregoing Sums, Units under Units, Tens under Tens, *&c.*

Addition of Money with the leſſer Denominations.

II. I need not here to acquaint you that four Farthings make a Penny, twelve Pence a Shilling, and twenty Shillings a Pound.

But thus much I desire you to mind in all Additions and Subtractions, the Title of your Account, and how many of the first Denomination do make one of the second, and how many of the second do make one of the third, and how many of the third do make one of the fourth; and so in this manner, if there are more. The Observation of this will much facilitate the Work, and save both you and me a great deal of Labour; therefore I shall only give one or two Examples of each, cast up to your hands.

For the effecting of this, consider as before, how many of the first Denomination do make one of the second, (which is here 20;) therefore for every 20 Shillings carry one Pound to the Pounds, as thus: 1, 6, 8, 7, and 1 Shilling is 23 Shillings; then come down upon the Tens, and say, 23 and 10 is 33, and 10 is 43, and 10 is 53, and 10 is 63, and 10 is 73, and 10 is 83 Shillings: now 83 Shillings being 4 Pound 3 Shillings, set down only the 3 Shillings, and carry 4 to the next, saying, 9, 1, 8, 1, 7, and 4 that I carried in my mind, is 30, set down 0, and carry the 3 to the next, saying, 1, 7, 3, 2, and 3 I carried, is 16; set down 6, and carry

1 to

1 to the next, saying, 3, 4, 1, 1, 1, 3, and 1 that I carried is 14; which by reason there is not any other Place to carry it unto, only set it down according to this Example.

l.	*s.*
327	11
107	10
100	17
138	18
471	16
313	11
1460	03

As before, so again consider the Title of your Account, and how many of the one do make the other; then begin with the first Figures at your right hand. 5, 7, 1, 8, and 1, which being added together make 22, and coming down upon the Tens say, 22 and 10 is 32, and 10 is 42, and 10 is 52, (and so on, if there were more.) Now consider how many Shillings 52 Pence make, *viz.* 4 Shillings and 4 Pence set down the 4 Pence, and carry the 4 Shillings to the Shillings, saying, 4 that I carry, and 8 is 12, and 7 is 19, and

is 20, and 3 is 23, and 6 is 29, and 1 is 30; then come down upon the Tens, 40, 50, 60, 70, 80, and 10 is 90 Shillings, which is 4 Pounds 10 Shillings; ſet down the 10 Shillings, and carry the 4 Pounds to the Pounds, ſaying, 4 and 6 is 10, and 1 is 11, and 5 is 16, and 7 is 23, and 1 is 24, which 4 ſet down and carry the 2 unto the 9, which will make 11, and 4 is 15, and 6 is 21, and 4 is 25, and 1 is 26, and 1 is 27, which ſet down, and the total amounts to 274 *l.* 10 *s.* 4 *d.* as you may ſee in this Example.

l.	*s.*	*d.*
11	11	11
10	16	08
47	13	10
65	11	11
41	17	07
96	18	05
274	10	04

You may make a Prick with your Pen at every 4 in the Farthings, and at every 12 in the Pence, and at every 20 in the Shillings: But this Way is neither ſo neat nor commendable; for if you once prick falſe, you muſt prick it all over again, which will look

look like ſo many Blots, and make you more ſubject to miſtake.

Therefore I recommend theſe two Tables following to you, to be gotten perfectly by heart, before you adventure upon Addition; as 1 Shilling is 12 Pence, 2 Shillings is 24 Pence, and ſo on.

Note, that

s.		*d.*
1	is	12
2	is	24
3	is	36
4	is	48
5	is	60
6	is	72
7	is	84
8	is	96
9	is	108
10	is	120
11	is	132
12	is	144

Note alſo, that

d.	*s.*	*d.*
20	is 1	8
30	is 2	6
40	is 3	4
50	is 4	2
60	is 5	0
70	is 5	10
80	is 6	8
90	is 7	6
100	is 8	4
110	is 9	2
120	is 10	0

The Proof of Addition.

Add all the Sums again (except the uppermoſt) which is here 300 *l.* 11 *s.* 6 *d.* 2 *q.* and then add the Total thereof unto the ſaid uppermoſt Line, and if it make the juſt Sum of the firſt Total, it is true, otherwiſe not.

Example

Example.	l.	s.	d.	qrs.
	300	11	06	2
	102	15	11	1
	106	17	10	0
	241	18	11	1
	601	11	11	1
	314	10	10	2
	611	11	11	1
Total	2279	19	00	0
	1979	07	05	2
Proof	2279	19	00	0

Addition of Cloth-Measure.

III. Note, *That* 4 *Nails is* 1 *Quarter of a Yard,* 1 *Yard* 4 *Quarters,* 1 *Ell Flemish* 3 *Quarters of a Yard,* 1 *Ell English* 5.

You see the Title of your Account is Yards, Quarters, and Nails; now observe how many Nails make one Quarter, which is 4; therefore for every 4 carry 1 Quarter to the Quarters; and likewise for every 4 Quarters, which make a Yard, carry

ry 1 Yard to the Yards, and in the Yards (or laſt Denomination of any Addition) for every 10 carry 1 to the next Place, until you come to the laſt Rank; which Total ſet down, as in theſe Examples.

yards.	*quar.*	*na.*
371	1	1
106	3	2
410	2	3
716	3	1
151	2	3
171	1	2
412	1	1
601	3	2
912	1	3
3855	1	2

yard.	*qr.*	*na.*
31	1	2
27	2	3
14	1	2
16	1	3
35	3	1
27	2	0
153	0	3

El. Eng.	*qr.*	*na.*
47	1	2
31	2	3
41	4	3
17	1	2
38	3	1
27	1	0
203	4	3
156	3	1
Proof 203	4	3

El. Fle.	*qr.*	*na.*
54	1	2
16	2	1
31	1	2
91	2	3
31	2	1
226	1	1

Addition of Wine-Meaſure.

IV. The ſame Order that is ſet down in the ſecond Section of this Chapter, is here to be obſerved; and likewiſe in all the Additions following.

Example.

For 2 *Pints carry* 1 *Quart, for* 2 *Quarts a Pottle, for* 2 *Pottles* 1 *Gallon, for* 63 *Gallons* 1 *Hogſhead, for* 4 *Hogſheads* 1 *Tun.*

	Tuns.	*hogſh.*	*gal.*	*pottles.*	*qrs.*	*pints.*
	321	3	16	1	0	1
	102	1	10	1	1	0
	317	1	15	0	1	1
	241	2	30	1	0	1
	317	1	40	1	1	1
	171	3	10	0	1	1
	141	2	10	1	0	1
	131	1	17	1	1	0
Tot.	1745	0	27	0	0	0
	1423	1	10	0	1	0
	1745	0	27	0	0	0

Addition of Troy Weight.

For 24 *Grains carry* 1 *Peny-weight, for* 20 *Peny-weight* 1 *Ounce, for* 12 *Ounces* 1 *Pound.*

℔	℥	*pw.*	*gr.*
371	11	19	23
102	10	10	11
413	11	16	10
176	03	19	11
912	10	18	10
341	11	13	22
2320	00	18	15

℔	℥	*pw.*	*gr.*
41	10	17	10
31	11	14	11
10	10	15	15
11	11	11	10
10	10	17	16
107	07	26	14

Addition of Averdupoize Weight.

For 16 *Ounces carry* 1 *Pound, for* 28 *Pounds carry one Quarter, for* 56 *Pounds* 2 *Quarters, for* 84 *Pounds* 3 *Quarters, for* 112 *Pounds* 4 *Quarters (or one Hundred Weight) for* 20 *Hundred* 1 *Tun.*

Example.

Example.

C.	qrs.	lb	z
91	3	27	15
10	1	16	14
11	2	10	10
31	1	11	12
71	1	11	10
10	3	15	11
227	2	10	08

Tuns	C.	qrs.	lb	z
91	19	3	17	15
16	11	1	11	14
91	11	2	11	11
60	11	3	10	11
31	10	2	11	13
78	11	1	13	13
41	11	2	11	11

Addition of Dry Measures.

For 16 *Pints carry* 1 *Peck, for* 4 *Pecks carry* 1 *Bushel.*

Bushels.	*Pecks.*	*Pints.*
317	1	10
102	3	11
413	2	10
171	1	11
106	3	10
1112	1	04

Bushels.	*Pecks.*	*Pints.*
400	1	10
103	2	10
710	1	11
317	1	10
106	3	11

Addition of Time.

For 60 Minutes carry 1 Hour, for 24 Hours 1 Day, for 365 Days 1 Year.

years.	*days.*	*hours.*	*min.*
37	150	11	12
31	110	10	10
14	175	15	23
10	101	11	11
11	137	12	14
10	101	11	13
115	046	23	23

Addition of Long Measure.

For 12 Inches carry 1 Foot, for 3 Foot 1 Yard.

yards.	*feet.*	*inches.*
18	1	10
17	2	11
10	2	07
31	1	10
41	2	11
10	0	10
194	0	11

yards.	*feet.*	*inches.*
300	2	11
101	1	10
602	2	11
101	1	10
101	0	08
710	1	11
810	2	10

CHAP.

CHAP. III.

Subtraction of Money.

SUbtraction teacheth to take any leſſer Number out of a greater, and how to know what remains.

I. *Subtraction of one Denomination.*

Firſt ſet down the greater Number from which you would ſubtract, and then place the leſſer Number to be ſubtracted under it, as in Addition, with a Line drawn beneath them.

Example.

Received — 379
Laid out — 136

Then take the firſt Figure towards the right hand in the Sum to be ſubtracted from the Figure over it; as 6 from 9 and there remains 3, which 3 ſet down; then 3 from 7 and there remains 4. Laſtly, 1 from 3 and there remains 2, which 2 ſet down.

379
136

And there remains unpaid — 243

But

But I ſhall give you one or two Examples, wherein the Figures of the Sum to be ſubtracted, are ſome of them greater and ſome leſſer than thoſe you muſt ſubtract from; therefore if there be only one Denomination, borrow 10 and add to the upper Figure; as in this Example.

Received ——	130624
Paid out ——	104146
Remains ——	026478

Say, 6 from 4 I cannot, but 6 from 14 and there remains 8, which ſet down; 1 that I borrowed and 4 makes 5, 5 from 2 I cannot, but 5 from 12 I may take, and there remains 7; which 7 ſet down. Then 1 that I borrowed and 1 is 2, 2 from 6 and there remains 4; now 4 from 0 I cannot, but 4 from 10 and there remains 6; then 1 that I borrowed and 0 is 1, now 1 from 3 and there remains 2. Then laſtly, 1 from 1 and there remains 0.

So that if you take 104146 from 130624 there remains 26478.

II. *Subtraction of ſeveral Denominations.*

But if there be ſeveral Denominations, then obſerve, as before in Addition of Money, how many of the firſt make one of the ſecond, and ſo on. And if the Figure or Figures be greater than thoſe you are to ſubtract from, borrow 1 from the next Denomination, and ſubtract from it; and add the Remains to the upper Figure.

	l.	*s.*	*d.*
Received ——	275	11	03
Laid out ——	196	12	05
Remains ——	078	18	10

Example. Take 5 *d.* from 3 *d.* I cannot, but 5 *d.* from a Shilling or 12 *d.* and there remains 7 *d.* which added to the 3 makes 10 *d.*

Again, One Shilling that I borrowed (for you muſt be ſure to pay what you borrow) and 12 is 13, which to take from 11 I cannot; then ſay, 13 *s.* from 20 *s.* and there remains 7, and the 11 makes 18, which ſet down.

Again,

Again, 1 that I borrowed and 6 is 7; now 7 from 5 I cannot, but 7 from 15, and there remains 8. Then 1 that I borrowed and 9 is 10; now 10 from 7 I cannot, but 10 from 17, and there remains 7, which ſet down. Then 1 that I borrowed and 1 is 2; 2 from 2 and there remains 0.

	l.	*s.*	*d.*
So that	196	12	05
being taken from	275	11	03
there remains	078	18	10

And thus in any other of this nature, obſerve that the ſame that you carried in Addition, the ſame you muſt borrow in Subtraction; as 12 in the Pence, 20 in the Shillings, and 10 in the laſt Denomination.

I need ſay no more, only I ſhall acquaint you how to know whether your Work be well done or no.

Proof of Subtraction.

Add the Remains to the Sum ſubtracted, and if it make the ſame Sum with that which you did ſubtract, it is true, elſe not. As in the laſt Example, 78 *l.* 18 *s.* 10 *d.* and 196 *l.* 12 *s.* 5 *d.* being added, do make the ſame Sum with the Sum received.

Sub-

Subtraction of Cloth-Meaſure.

	Yards.	*qrs.*	*na.*		*Ells Flem.*	*qrs.*	*na.*
Bought	3712	1	2	Bought	4171	2	1
Sold	1913	2	1	Sold	1317	2	3
Rems.	1798	3	1	Rems.	2853	3	2
Proof	3712	1	2				

	Ells Eng.	*qrs.*	*na.*
Bought	4716210	2	1
Sold	1091317	3	3
Remains	3624892	3	2

Subtraction of Averdupoize Weight.

For the better underſtanding of the Rule, obſerve (as you did before) the Title of your Account; and where you cannot take one Number out of another, take it out of the next Denomination; as you ſee here, 10 from 10 I cannot, but 12 Drams from 1 Ounce there reſteth 4, and the 10 makes 14;

14; 14 from 11 I cannot, but 14 from 16 and there remains 2; 2 and 11 is 13. Now 1 that I borrowed and 14 is 15; 15 from 11 I cannot, but 15 from 28 and there remains 13; 13 and the 11 is 24. Now 1 that I borrowed and 3 is 4; 4 from 2 I cannot, but 4 from 4 and there remains nothing, but 2 is 2, which you muſt ſet down. Now 1 that I borrowed and 8 is 9; 9 from 7 I cannot, but 9 from 17 and there remains 8. Now 1 that I borrowed and 1 is 2, 2 from 4 and there remains 2.

	C.	*qr.*	*lb*	*oun.*	*dr.*
Bought	47	2	11	11	10
Sold	18	3	14	13	12
Remains	28	2	24	13	14

CHAP.

CHAP. IV.

MULTIPLICATION.

The Multiplication Table.

2	2	is	4	5	25
	3		6		30
	4		8		35
times	5	is	10	times	40
	6		12		45
	7		14		
	8		16		
	9		18		

3	3	is	9	6	36
	4		12		42
	5		15		48
times	6	is	18	times	54
	7		21		
	8		24		
	9		27		

4	4	is	16	7	49
	5		20		56
	6		24		63
times	7	is	28	times	
	8		32		
	9		36		

8 times 8 is 64
9 times 9 is 81
10 times 10 is 100

I. For

1. FOr the clearer underſtanding of this Table, obſerve the Figures in the Margin, 2, 3, 4, *&c.* and the Word [times] adjoining to them; ſay, 2 times 2 is 4, 2 times 3 is 6, 2 times 4 is 8, 2 times 5 is 10, *&c.* After you know well how to read it within Book, you muſt of neceſſity get it very perfectly by heart, before you can make any farther Progreſs in this Art.

The Uſe of Multiplication.

Multiplication ſerveth inſtead of many Additions, and teacheth of two Numbers given to encreaſe the greater as often as there are Units in the leſſer.

There are three things ſtrictly to be obſerved, *viz.*

1. The *Multiplicand*, or Sum to be multiplied.
2. The *Multiplier*, or Sum by which you multiply.
3. The *Product*, or Sum produced.

Ask how much is 7 times 52, or in 52 Weeks how many Days there are?

If you would add 7, 52 times, it would

be a tedious Work; but Multiplication will do that at once, that Addition ſhou'd do at many times. In Multiplication therefore firſt ſet down the greateſt Number, and the leſſer under it, beginning at the right hand, and multiply every Figure of the Multiplicand by each Figure of the Multiplier; then (do as in Addition) ſet down all that is under Ten, or above Ten, or Tens, and for every Ten (or Article) carry One to the next Place, and in the laſt Place ſet down the Tens.

Example.

52	*Multiplicand.*
7	*Multiplier.*
364	*Product.*

Begin with the Multiplier, ſaying, 7 times 2 is 14, ſet down the 4 under 7, and cary 1 to the next Place, ſaying, 7 times 5 is 35, and 1 that I carried is 36, which ſet down as you ſee in the Example: ſo that 7 times 52 is 364.

In 3712 Shillings how many Farthings? or, How much is 48 times 3712?

Be careful in ſetting the Figures of the Multiplier under the Multiplicand; for Units

Units muſt be under Units, Tens under Tens, Hundreds under Hundreds; and having rightly placed your Figures, then proceed according to your former Example, ſaying, 8 times 2 is 16, ſet down 6, and carry 1 to the next Place, ſaying, 8 times 1 is 8, and 1 that I carried is 9, ſet down 9, and carry nothing, ſaying, 8 times 7 is 56, ſet down 6, and carry 5 to the next Place, ſaying, 8 times 3 is 24, and 5 is 29, which ſet down. And having done with the firſt Figure of the Multiplier, cancel it with a daſh of the Pen, and proceed to the next, ſaying, 4 times 2 is 8, which 8 ſet down directly under the Multiplier, then ſay, 4 times 1 is 4, which ſet down, then 4 times 7 is 28, which 8 ſet down, and carry 2; then 4 times 3 is 12, and 2 that I carried is 14, which being ſet down, you ſhall find 48 times 3712 to be 178176.

3712
48
29696
14848
178176

How to multiply by 10, 100, 1000, 10000.

Look how many Cyphers you have in your Multiplier, add them to your Multiplicand, and the Total thereof ſhall be the Product.

Example.

Multiply	by	*facit*
63	10	630
36	100	3600
85	1000	85000
92	10000	920000
73	100000	7300000

How to multiply 20, 40, 300, 5000, *&c.*

As many Cyphers as there are in the Multiplier, ſet them down towards the right hand, and multiply the reſt as before is taught.

Example.

37	232
20	300
740	69600

How

How to prove Multiplication.

First, Caſt away the Nines of the Multiplicand, (in your former Example) 3712, ſaying, 3 and 7 is 10, caſt away 9, and there remains 1; then 1 and 1 is 2, and 2 is 4, which ſet on the right ſide of a Croſs, thus:

\+ 4

Then caſt away the Nines of the Multiplier, ſaying, 4 and 8 is 12, caſt away the 9, and there remains 3, which place on the left ſide, thus: 3 ✝ 4

Then multiply the one by the other, ſaying, 3 times 4 is 12, caſt away 9 and there remains 3, which place at the top of the Croſs, thus:

3
3 ✝ 4

Laſtly, Caſt away the Nines of the Product, ſaying, 1 and 7 is 8, and 8 is 16, caſt away 9 and there remains 7; then 7 and 1 is 8, and 7 is 15, caſt away 9 and there remains 6; then 6 and 6 is 12, caſt away 9 and there remains 3, which place at the bottom of the Croſs, and if the top Figure and the bottom be alike, your Work may be true.

This is the common Way to prove Multiplication: But the moſt certain Proof

is by Diviſion, as hereafter I will ſhew you.

II. Yet for the more perfect underſtanding of Multiplication; I have here laid it down in the Nature of the *Golden Rule*, which though it be not according to the uſual Method of Teaching, yet the experience I have had thereof, ſheweth me, that it will inform any one more throughly in the nature of this Rule, than any directions I have yet read; for trial hereof, take ſundry Examples, wrought only by multiplying ſecond and third Numbers together, as theſe following.

Example.

If 1 Yard coſt 17 *d.* what coſt 40 Yards?

17
40

280
---
facit 680 *d.*

If 1 Pound coſt 19 *d.* what coſt 112 Pound?

19
112

1008
---
facit 2128

If

If 1 Shilling make 12 *d.* what will 20 *s*?

20

facit 240 *d.*

If 1 Shilling make 48 *q.* what will 20 *s*?

20

facit 960 *farthings.*

If 1 Crown be 60 *d.* what 500 Crowns?

60

30000 *d.*

If 1 Yard be 16 Nails, what 576 Yards?

16

3456
576

9216 *Nails.*

If 1 Ell *Eng.* make 20 Nails, what 246 Ells?

20

facit 4920 *Na.*

If 2 Gallon makes 8 Pints, what 63 Gallons?

8

facit 504 *Pints.*

If 1 Hogſh. make 63 Gall. what 4 Hogſh.?

4

facit 252 *Gallons.*

If 1 Tun makes 252 Gallons, what 20 Tun?

20

facit 5040 Gallons.

If 1 Inch be 3 Barly corns, what 12 Inches?

3

facit 36

If 1 Foot be 12 Inches, what 379 Feet?

12

facit 4548

If 1 Yard be 3 Feet, what 478 Yards?

3

facit 1434

If 1 Furlong be 40 Poles, what 846 Furlongs?

40

facit 33840

If 1 Mile be 8 Furlongs, what 100 Miles?

8

facit 800

If 1 Pound be 12 Ounces, what 176 Pounds?

12

facit 2112

If

If 1 Ounce be 20 Peny-weight, what 12 Ounces?

12
20

facit 240

If 1 Peny-weight be 24 Grains, what 20 Peny weight?

20

facit 480

If 1 Pound be 16 Ounces, what 112 Pounds?

16

672
112

facit 1792

If 1 Quarter be 28 Pounds, what 4 Quarters?

4

facit 112

If 1 C. be 112 Pounds, what 20 C?

20

facit 2240

If 1 Tun be 20 C. what 846 Tuns?

20

facit 16920

If 1 C. groſs alloweth 15 Pound Tare, what will 72 C. groſs?

15
72

360
---

facit 1080 *l. Tare.*

If 1 C. groſs give 13 *l.* Tare, what will 96 C. groſs give?

13
96

288
---

facit 1248

If 1 Dollar be 56 *d.* what 500 Dollars?

56
500

3000
2500
---

facit 28000 *Pence.*

If 1 *French* Crown be 6 *s.* what 866?

866
6
---

facit 5196

If

If 1 *l.* cost 37 *d.* what cost 475 *l*?

37

3325
1425

facit 17575

CHAP. V.

DIVISION.

DIvision is that by which we know how many times a lesser Sum is contained in a greater.

The Parts of Division.

In Division observe,
1. The *Dividend.*
2. The *Divisor.*
3. The *Quotient.*
4. The *Remainder.*

1. The *Dividend* is the Sum to be divided.

2. The *Divisor* is the Sum by which we divide.

3. The *Quotient* is the Sum produced, and containing so many times the *Divisor*, as it self is in value.

4. The

4. The *Remainer* is always leſs than the *Diviſor.*

Firſt, Set down the Dividend, and right under it, towards the left hand, the Diviſor.

Example.

Being to divide 4648 Half-pence by 2, the Number of Half-pence in a Peny,

I firſt ſet down the Dividend, and then the Diviſor under the firſt Figure, thus:

4648 (
2

But if the Figure or Figures juſt over the Diviſor be leſs than the Figures under it, the Diviſor muſt be removed one Degree or Place more towards the right hand.

Example.

I would divide 4648 Farthings by 48, the Number of Farthings in a Shilling; then I muſt ſet down my Diviſor thus:

4648 (
48

And at the End of the two Numbers make a crooked Line, wherein to include the Quotient, thus: (

Yet before you begin your Work, conſider three things, *viz.*

1. *Seek how often the Diviſor is contained in the Dividend.*

2. *Multiply the Quotient and Diviſor together.*

3. *Sub-*

3. *Subtract the Product from the Dividend.*

To propound then the former Example: In 4648 Half-pence, if I would know how many Pence,

4648 (2
2

I muſt ſeek how many times 2 is contained in 4, which is twice; then I ſet 2 in the Quotient, and multiply it by the Diviſor, ſaying, 2 times 2 is 4; now 4 from 4 and there remains nothing; which 2 having performed its firſt Office, I cancel with a daſh of the Pen, and remove it one Place nearer the right hand, thus:

4648 (23
2 2

Then I ſay again, How many times 2 in 6? which is 3 times; I ſet down 3 in the Quotient, and multiply by 2, ſaying, 3 times 2 is 6; now 6 from 6, and there remains 0.

Again, I remove the Diviſor, thus:

4648 (23
2 2 2

and

and try how many times 2 in 4, which is two times; therefore I set 2 in the Quotient, and multiply it by 2 (the Divisor) saying, 2 times 2 is 4, now 4 from 4, and there remains 0.

4648 (232
xxx

Again, I remove the Divisor, and try again how often 2 is contained in 8, which is 4 times; I set 4 in the Quotient, and multiply it by 2, saying, 4 times 2 is 8: now 8 from 8, and there remains 0.

4648 (2324
xxxx

Another Example with one Figure.

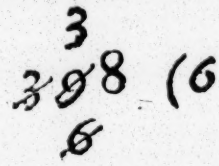
Suppose there is 398 Pounds to be equally divided between 6 Men; the Demand is, What each Man must have?

First, I set down the Dividend 398, and 6 (the Divisor) under the 9, thus, because I cannot take 6 out of 3.

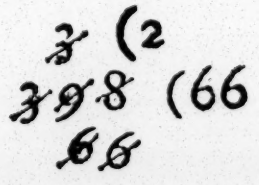
398 (6
6

Then I try how many times 6 I can have in 39, which is 6 times; I place 6 in

in the Quotient beyond the crooked Line, ſaying, 6 times 6 is 36; now 36 from 39, and there remains 3, which I ſet down over the 9, and cancel the 39, and 6 my Diviſor, thus:



Again, I remove my Diviſor to the next Place under 8, and ſeek how many times 6 I can have in 38, which is alſo 6 times: I ſet 6 in the Quotient, ſaying, 6 times 6 is 36, 36 from 38, and there remains 2, which 2 I ſet over the 8, and cancel my 6, thus:



So that every Man muſt have 66 *l.* and 2 *l.* over; which I may turn into Pence, and divide alſo by 6, and the Quotient will be 80 Pence, which is in all 66 Pound 6 Shillings and 8 Pence apiece.

This Order I obſerve to divide by one Figure: But if the Diviſor do conſiſt of more Figures than one, I muſt take the firſt Figure of the Diviſor no oftner out of the Dividend than

then I can also take all the rest of the Divisors out of the Dividend that stands above them, as in the Examples following may appear.

But before you proceed to divide by two Figures or more, be careful to understand well how to divide by one.

How to prove Multiplication.

In Multiplication I told you, that the most certain Proof for that Rule, was by Division; I shall therefore take the Product of one of the Multiplications before-going, and divide it by the Multiplier thereof, to try the former Work; as for Example.

I would divide 178176 by 48, which was one of the former Products in Multiplication; which Numbers place as in the Example following.

178176 (
48

First, I seek how many times 4 is contained in 17, which I find 4 times: now 4 times 4 is 16; 16 from 17, and there remains 1, which makes the 8 to be but 18; now 4 times 8 is 32, 32 from 18 I cannot, therefore 4 times is too much.

2. I

2. I ſeek whether 3 times will do it, ſaying 3 times 4 is 12; now 12 from 17, and there remains 5, which makes the 8 to be 58: Then I ſay, 3 times 8 is 24; now 4 from 8, and there remains 4, then 2 (that I carried) from 5, and there remains 3.

3
5 4
x7 8 176 (3
4 8

3. I remove the Diviſor one Place nearer the right hand, ſaying, How many times 4 in 34? which is 7 times (becauſe 9 or 8 times are too many) then 7 times 4 is 28; now 28 from 34 and there remains 6: then 7 times 8 is 56; 6 from 1 I cannot, but 6 from 11, and there remains 5: then 5 I carried, and 1 I borrowed is 6: now 6 from 6 and there remains 0.

3 6
5 4 5
x7 8 x76 (37
4 8 8
4

Again, I remove the Diviſor, ſaying, How

how many times 4 in 5, which is once; then I ſay, Once 4 is 4: now 4 from 5 and there remains 1. Then once 8 is 8; now 8 from 17 and there remains 9, and 1 that I borrowed from 1, there remains nothing.

36x
5459
x78x76 (371
4888
44

Again, I remove the Diviſor, and ſeek how many times 4 is in 9, which is twice; ſaying, 2 times 4 is 8; now 8 from 9, and there remains 1. Then 2 times 8 is 16; now 16 from 16, and there remains nothing. So that I find the Quotient to be 3712, the ſame as the Multiplicand was in the Multiplication, which is a moſt certain Proof of that Rule.

How to prove Diviſion.

36xx
5459 (0
x78x76 (3712
48888 48
444 ———
29696
14843
———
Proof —— 178176

And

And as Diviſion is a ſure Proof of Multiplication, ſo Multiplication is the ſureſt Proof of Diviſion, which is performed by multiplying the Quotient with the Diviſor; and if the Product thereof be the ſame with the Dividend, your Diviſion is well wrought, otherwiſe be ſure ſome Error is committed in your Work.

Alſo if any Figures remain after your Diviſion is ended, they muſt be added into the Product of your Multiplication, according to their ſeveral Places, and then (if true) the Total will be likewiſe the ſame with the Dividend; as, for Example, doth appear in the laſt Sum of this Rule.

A more eaſie Way of Diviſion, and with fewer Figures.

There are 4648 *Shillings to be equally divided betwixt* 34 *Men: I demand, What is each Man's Proportion?*

I will not ſtand to ſhew you more of this common Way of Diviſion, which is indeed very tedious and burthenſom to the Memory, and hath cauſed (to my knowledge) many to deſpair of attaining it, and ſo pro-

proceeding further in this Art. But proceed by the Method following, which will enable one to go on with far more eaſe and delight than commonly is ſeen.

The Queſtion being ſtated, is to be ſet thus:

4684 (
34

Wherein conſider how often 34 is contained in 46, which is once (or rather ſee firſt how often 3 is contained in 4, which likewiſe is once) then ſet 1 in the Quotient, ſaying, once 4 is 4: now 4 from 6 and there remains 2, which 2 ſet directly over its Dividend.

12
4684 (1
34

Then go backward to the next, ſaying, once 3 is 3, 3 from 4 and there remains 1, which alſo ſet over the 4, and cancel it, and 3 the Diviſor, with a daſh of the Pen, as you ſee in the Example.

Then remove the Diviſors one Degree further towards the right hand, thus:

12
4684 (1
344
3

Then

Then conſider how often 3 is contained in 12, which is 4 times: but 4 times the next Diviſor cannot be taken out of 8, and you muſt never take one of the Diviſors oftner than you can take all the reſt; ſeeing then 4 times is too much, try (in your mind) whether each Diviſor can be taken 3 times; if ſo, then place 3 in the Quotient, ſaying, 3 times 4 is 12,

```
  2
  x x 6
  4 6 8 4 (13
  3 4 4
    3
```

12 from 8 I cannot, but 12 from 18, and there remains 6; then 3 times 3 is 9, and 1 that I carried is 10, 10 from 12, and there remains 2.

Again, remove your Diviſor towards your right-hand, thus:

```
    2
  x x 6
  4 6 8 4 (13
  3 4 4 4
    3 3
```

Then conſider how often 3 is contained in 26, which is 8 times, and 8 times 3 is 24; now 24 from 26 and there remains 2, which 2 will make the next Figure to be but 24; then 8 times 4 is 32, 32 out of 24 cannot be,

an

and therefore ſay, 8 times is too much: which ſeeing ſo, try (in your Mind) whether 7 will do it, ſaying, 7 times 4 is 28; 28 from 4 I cannot, but 28 from 34 and there remains 6. Then 7 times 3 is 21, and 3 that I carried is 24: 24 from 26 and there remains 2. Cancel out the Dividend and Diviſor, and ſet the Remains over head, and the Work is done.

2 (2
~~x~~26 (6
~~4~~684 (137
~~3~~444
~~3~~3

The *Quotient* ſheweth that 34 Men muſt have 137 Shillings apiece, and 26 Shillings over and above, to be divided amongſt them.

Which Remainders, and all others of any Diviſion, I ſhall ſhew you what they are when you practiſe Fractions, as the Place more convenient and proper.

4 Example.

There is a Ship taken by 346 *Seamen, which is valued at* 87654 l. *to be equally divided*

divided amongſt them, I demand what each Man muſt have.

87654 (
346

Conſider how many times 346 is contained in 876, which is two times: or rather how often 3 is contained in 8, which is likewiſe 2 times: ſet 2 in the *Quotient*, and ſay, 2 times 6 is 12, 12 from 6 I cannot, but 12 from 16 and there remains 4.

Then 2 times 4 is 8, and 1 that I borrowed is 9: 9 from 7 I cannot, but 9 from 17 and there remains 8. Then 2 times 3 is 6, and 1 is 7: 7 from 8 and there remains 1. Then having done with the Diviſors, remove them to the next Place towards the right hand, thus:

184
87654 (2
346

Then ſay, How many times 3 in 18? 6 times: but that being too much (becauſe all the reſt cannot be taken ſo often) therefore ſay, 5 times 6 is 30, 30 from 5 I cannot, but 30 from 35, and there remains 5.

184
87654 (2
3466
34

Then 5 times 4 is 20, and 3 that I borrowed

rowed is 23, 23 from 4 I cannot, but 23 from 24, and there remains 1.

```
  11
 x845
 87654 (25
 34666
   34
```

Then 5 times 3 is 15, and 2 that I borrowed is 17; 17 from 18, and there remains 1.

Again, remove the Divisors (pondering in your mind) how many times 3 can I have in 11? three times; by which I perceive 3 will do it; therefore place it in the Quotient, saying, 3 times 6 is 18, 18 from 4 I cannot, but 18 from 24, and there remains 6; then 3 times 4 is 12, and 2 that I carried is 14, 14 from 5 I cannot, but 14 from 15, and there remains 1: Then 3 times 3 is 9, and 1 that I carried is 10, 10 from 11 and there remains 1.

```
   (1
   xx(1
 x845(6
 87654 (253
 346666
  344
   3
```

5 Ex.

5 Example.

There is a City taken in the Wars by 9034 *Soldiers, that is worth* 7306242 l. *I demand what each Soldier muſt have.*

7306242 (
9034

Here you ſee that 9034 cannot be contained in 7306; therefore remove your Diviſor to the next Place towards the right hand, thus:

7306242 (
9034

1. Conſider how many times 9 can be had in 73, which is 8 times; place 8 in the Quotient, ſaying, 8 times 4 is 32, 32 out of 2 I cannot, but 32 out of 32 and there remains 0.

Then 8 times 3 is 24, and 3 that I borrowed is 27; 27 from 6 I cannot, but 27 from 36 and there remains 9.

Then 8 times 0 is 0, but 3 that I carried is 3, 3 from 10 and there remains 7.

790
7306242 (8
9034

Then 8 times 9 is 72, and 1 that I borrowed is 73; 73 from 73, and there remains 0.

Again, remove your Divisor.

Here you also see, that 9034, the Divisor, cannot be taken out of the Dividend; therefore cancel it, and remove it to the next Place, setting a Cypher in the Quotient.

```
   790
7306242 (80
 90344
  903
```

Then try again how often the Divisor is contained in the Dividend, which is 8 times.

Then say, 8 times 4 is 32; 32 out of 2 I cannot, but 32 out of 32, and there remains 0.

Then 8 times 3 is 24, and 3 that I borrowed is 27; 27 from 4 I cannot, but 27 from 34, and there remains 7.

```
   (6(7
   790 (7(0
 7306242 (808
  903444
   9033
    90
```

Then 8 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10, and there remains 7.

Then

Then 8 times 9 is 72, and one that I borrowed is 73; 73 from 79, and there remains 6. So that every Soldier muſt have for his Share 808 Pounds.

6 *Example.*

What is the Quotient of 56037478, *divided by* 2306803?

Conſider how often the Diviſor is contained in the Dividend, which is here twice.

990141
56037478 (2
2306803

Then ſay, 2 times 3 is 6, 6 from 7, and there remains 1.

Then 2 times 0 is 0; 0 from 4, and there remains 4.

Then 2 times 8 is 16; 16 from 7 I cannot, but 16 from 17, and there remains 1.

Then 2 times 6 is 12, and 1 that I borrowed is 13; 13 from 3 I cannot, but 13 from 13, and there remains 0.

Then 2 times 0 is 0, but 1 that I borrowed is 1; 1 from 0 I cannot, but 1 from 10, and there remains 9.

Then 2 times 3 is 6, and 1 that I borrowed is 7: 7 from 61 cannot, but 7 from 16 and there remains 9.

Then 2 times 2 is 4, and 1 that I borrowed is 5: 5 from 5, and there remains nothing.

Remove the Diviſor.

Again, conſider how many times the Diviſor is contained in the Dividend, which is 4 times.

6 7 4 2 0
9 9 0 x 4 x 6
5 6 0 3 7 4 7 8 (24
2 3 0 6 8 0 3 3
2 3 0 6 8 0

Then ſay, 4 times 3 is 12; 12 from 8 I cannot, but 12 from 18 and there remains 6.

Then 4 times 0 is 0, but one that I borrowed is 1; 1 from 1 and there remains 0.

Then 4 times 8 is 32; 32 from 4 I cannot, but 32 from 34 and there remains 2.

Then 4 times 6 is 24, and 3 that I borrowed is 27; 27 from 31 I cannot, but 27 from 31 and there remains 4.

Then

Then 4 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10, and there remains 7.

Then 4 times 3 is 12, and 1 that I borrowed is 13; 13 from 9 I cannot, but 13 from 19, and there remains 6.

Then 4 times 2 is 8, and 1 that I borrowed is 9; 9 from 9, and there remains 0: So that the Quotient is 24, or the Diviſor is contained in the Dividend 24 times.

Having laid down the latter Part of the former Rule in the nature of the Rule of Three, and apprehending it very neceſſary for young Learners, I ſhall therefore obſerve the ſame here in Diviſion, which is performed by dividing the ſecond Number by the firſt, and the Quotient is the Anſwer to the Queſtion.

If 63 Gallons make 504 Pints, what 1 Gallon?

504 (8 *Pints.*
63

If 4 Hogſheads make 252 Gallons, what 1 Hogſhead?

252 (63 *Gallons.*
44

If 20 Tuns make 5040 Gallons, what 1 Tun?

x
5040 (252 *Gallons.*
220

If 72 C. gross allow 1080 Pound for Tare, what must 1 C. allow?

36
1080 (15 *Pounds facit.*
72
7

If 152 C. cost 760 Pounds, what 1 C?

760 (5 *Pounds facit.*
152

If 500 Dollars be 28000 *d.* what 1 Dollar?

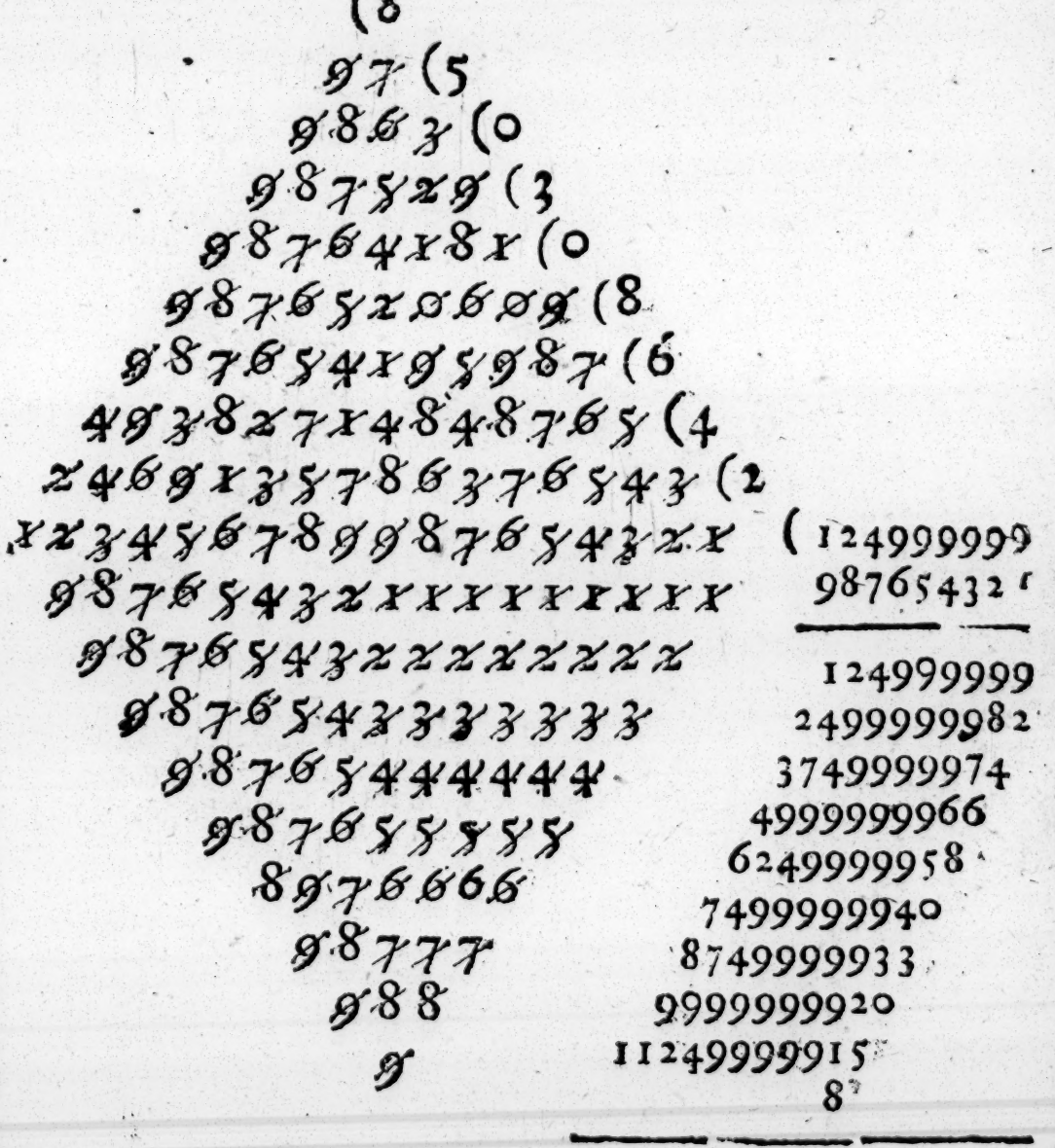
3
28000 (56 *Pence facit.*
500

As in Multiplication, when the Multiplier is 10, 100, 1000, *&c.* you add to the Multiplicand on the right hand so many Cyphers as are in the Multiplier, to make the Product; so in Division, when the Divisor is 10, 100, 1000, *&c.* you must cut off so many Figures from the Dividend to the right hand (with a perpendicular Line) as there are Cyphers in the Divisor, and the Figures to the left hand are the Quotient. Divide 375900 by 10, or 100, *&c.*

Quot. 37590 | 0. *Quot.* 3759 | 00.

I shall

I shall not (I hope) need to trouble my self, or Learner, to shew the Working of this Sum, or any other, having now (as I suppose) sufficiently treated of Division; but will leave it to the censure of the most experienc'd to judge, whether this Manner of Dividing be not plain, lineal, and to be wrought with fewer Figures than any which is commonly taught: As for Example appeareth.



CHAP. VI.

REDUCTION.

1. AS for *Reduction*, though it be no Rule absolute of it self, but meerly wrought by Multiplication and Division (as I have here manifested in a plain manner) yet I think good not (altogether) to omit it, lest any should censure me for so doing, in regard it is very usually practised: To deliver somewhat therefore concerning it.

Reduction teacheth one to bring all gross or great Denominations into small, and small into great

First, All great Denominations are brought into small by Multiplication; as,

Pounds multiplied by 20, *are Shillings.*
Shillings multiplied by 12, *are Pence.*
Pence multiplied by 2, *are Half-pence.*
Pence multiplied by 4, *are Farthings.*
Pounds multiplied by 240, *are Pence.*
Pounds multiplied by 480, *are Half-pence.*
Pounds multiplied by 960, *are Farthings.*

Secondly,

Secondly, All ſmall Names are brought into great by Diviſion; as,

Shillings divided by 20, *are Pounds.*
Pence divided by 12, *are Shillings.*
Half-pence divided by 2, *are Pence.*
Farthings divided by 4, *are Pence.*
Pence divided by 240, *are Pounds.*
Half-pence divided by 480, *are Pounds.*
Farthings divided by 960, *are Pounds.*

1000
20

20000 *s.*
12

240000 *d.*
4

960000 *q.*

1. Conſider whether the Sum propounded be to be brought into a greater or a leſſer Denomination.

2. Conſider how many of the one can make the other; as here, how many Shillings can make a Pound, *viz.* 20: and *contrà*, how many Shillings a Pound makes, *viz.* 20.

Therefore of neceſſity there muſt be 20 times ſo many, which being multiplied by 20, make 20000 Shillings, and by 12, 240000 Pence, and by 4 *facit* 960000 Farthings; as in the Example.

In 960000 Farthings, how many Pence, Shillings, and Pounds?

x
960000 (940000 (2000 | 0 *s.*
444444 (xxxxxx 1000 *l. facit.*
xxix

To bring Shillings into Pounds (or to divide by 20) cut off the firſt Figure towards the right hand with a daſh of the Pen, and take half of the remaining Figures.

In 8471213 Farthings, how many Pence, Groats, and Nobles?

xx (1 xyxx (1
847xxxx xxx780(3 (52945 | 0
4444444 44444 4
facit 26472 *Nobles.*

Here

Here you ſee the Sum is to be brought into a greater Denomination than it ſelf, which is therefore to be done by Diviſion.

Then you are to conſider what your Diviſor muſt be, which is here 4, becauſe 4 Farthings make a Peny; and as often as 4 is contained in the ſaid Sum, ſo many Pence there are.

Your Farthings then being brought into Pence, conſider the next Denomination what it is, and how many of the former make one of it; as how many Pence make a Groat, *viz.* 4; and look how many times 4 is contained in the Sum, ſo many Groats there are.

Having brought the Pence thus into Groats, endeavour to bring them into Nobles, by conſidering how many Groats make a Noble, *viz.* 20; therefore divide by 20, (by cutting off the firſt Figure towards the right hand, and taking the half of the reſt) and your Quotient will be Nobles.

I ſhall ſay no more as to Reduction of Money, only leave two or three Queſtions for the Learner to practiſe upon.

In 100 *l.* how many Farthings, Pence, Shillings, Three-pences, and Nine-pences?

In

In 47162 Marks, how many Nobles, Pounds, Groats, Farthings, 6 *d.* and 2 *d*?

In 7665 *l.* 11 *s.* 10 *d.* how many Shillings, Pence and Pounds, Farthings, Crowns, and *ob.*

Reduction of Cloth Measure.

II. *Observe in this and all the Reductions following, how many of the one Denomination do make one of the other, and so multiply or divide according to the two Rules aforegoing, in Reduction of Money.*

In 4372 Yards, how many Qrs. and Ells *Flem.*

4

17488 *Qrs.*

2 0 2 (1
2 7 4 8 8 (5829 $\frac{1}{3}$ *facit.*
3 3 3 3

In 7862 Ells *Eng.* how many Qrs. & Yards?

5

39310 *Qrs.*

3 1 3 (2
3 9 3 1 0 (9827
4 4 4 4

In 85 Pieces, each 19 Ells $\frac{2}{5}$, how many Qrs, Nails, and Yards? *Re-*

Reduction of Wine-Measure.

III. In 35 Tuns, how many Hogsheads, Gallons, Pottles, Quarts, and Pints?

35
4
---
140 *Hogsh.*
63

420
840

8820 *Gallons.*
4

35280 *Quarts.*
2

70560 *Pints.*

In 4712568 Pints, how many Gallons and Rundlets, each Rundlet 11 Gallons?

In 327 Barrels, each 32 Gallons, how many Hogsheads and Tuns?

Re-

Reduction of Time.

IV. In 1659 Years, how many Days, Hours, and Minutes? { 365 Days a Year. 24 Hours a Day. 60 Min. an Hour.

1659 *Years.*
365

8295
9954
4977

605535 *Days.*
24

2422140
1211070

14532840 *Hours.*
60

871970400 *Minutes.*

In 87167155 Minutes, how many Hours, Days, and Years?

In 20 Years and an half, how many Days, Hours, and Minutes?

Re-

Reduction of Land-Measure.

In 100 Miles, how many Furlongs, Poles, Feet, Inches, and Barley-corns?

8 Furlongs a Mile.
40 Poles a Furlong.
16 ½ Feet a Pole.
3 Feet a Yard.
12 Inches a Foot.
3 Barley-corns an Inch.

100 *Miles.*
8

800 *Furlongs.*
40

32000 *Poles.*
33

96000
96000

½ 1056000 *Half Feet.*

528000 *Feet.*
12

6336000 *Inches.*
3

19008000 *Barley corns.*

Re-

Reduction of Troy-Weight.

VI. In 87 Pound and $\frac{1}{2}$, how many Ounces, Peny-weights, and Grains?

87 lb $\frac{1}{2}$
12

174
876

1050 $\frac{3}{3}$
20

21000 *Pw.*
24

84000
42000

504000 *Grains.*

In 7151213 Grains, how many Peny-weights, Ounces, and Pounds?

In 15 Ingots, each 7 Pound and $\frac{1}{2}$, how many Ounces, Peny-weights, and Grains?

Re-

Reduction of Averdupoize Weight.

VII. In 96 C. weight, how many Qrs. lb. and ℥?

4

384 *Quarters.*
28

3072
768

10752 *Pounds.*
16

64512
10752

172032 *Ounces.*

In 40 C ½ 19 Pounds 11 Ounces, how many Qrs lb. and ℥?

4

162 *Quarters.*
28

1305
325

4555 *Pounds.*
16

27331
4556

72891 *Ounces.*

In

In 8714 Ounces, how many Pounds, Qrs. and C?

In 20 Bags, each 3 C $\frac{1}{2}$, how many Qrs. and Pounds?

4
14
28
112
28
392 *Pounds in one.*
20
7840 *Pounds in all.*

Where you find the Word [each] *have a ſpecial regard to it, and reduce the Particulars which it implieth, firſt into one Denomination; then when you know how much is contained in one, you may eaſily know how much is in all.*

In 36 Barrels of Figs, each 3 C $\frac{1}{4}$ groſs, Tare 19 Pounds *per* Barrel, how many Pounds neat?

Whether the Word [Tare] *imply* per Bag, per Barrel, *or* per C. *&c. it is all as one, if you keep to your former Rule in Multiplication, by obſerving which you cannot miſs of what you would know: as here Tare* 19 *Pounds* per Barrel.

Say, If 1 Barrel give 19 Pounds, what 36 Barrels? Mul-

Multiply 19 and 36 together, and the Product is Pounds Tare; then ſubtract the Pounds Tare from the Pounds Groſs, and the Remains are Pounds Neat.

36 *Barrels.*
19 *Tare for* 1 *Barrel.*

324
36

684 *Tare in all.*

3 C $\frac{1}{4}$
4

13
28

104
26

364 ℔ *in* 1 *Barrel.*
36

2184
1092

13104 ℔ *groſs.*
684

12420 ℔ *neat.*

In 45 Bags of, *&c.* each 17 C $\frac{1}{2}$ groſs, Tare 15 Pounds *per* Bag, how many C. neat?

In 47 C $\frac{1}{2}$ groſs, Tare 17 Pounds *per* C. how many Pounds neat?

In

In 5 Hogſheads of Tabacco, each containing as followeth, how many C. neat? *viz.*

Number	containing C. qrs. lb	Tare lb
1	4—2—11	63
2	3—1—12	72
3	2—3—16	56
4	4—1—20	75
5	3—2—27	64

In 57120 C $\frac{1}{2}$ of Lead, how many Fother at 19 C $\frac{1}{2}$?

In 5671 Pigs of Lead, each 7 C $\frac{1}{2}$, how many Fother at 19 C $\frac{1}{2}$?

Facit 2181 Fother $\frac{21}{39}$.

CHAP. VII.

Numeration of Fractions.

THE next Things to be treated of, are Fractions:

Concerning which, I ſhall ſhew,

1. What a Fraction is.
2. How it is expreſs'd.
3. How many ſorts of Fractions there are.

A Fraction or broken Number is a Part or many Parts of a whole Number: For as whole Numbers take their beginning from One, and continue in Number without end; ſo the ſaid whole Numbers by Imagination may be diſſolv'd or broken into Pieces or Parts infinite.

Therefore to attain the knowledge of them, acquaint your ſelf with theſe two Terms, *Numerator* and *Denominator*.

The *Numerator* expreſſes the Number of the Parts.

The *Denominator* giveth thoſe Parts their Names.

$\frac{1\ 2\ 3}{2\ 3\ 4}$ 1 2 3 Numerator. 2 3 4 Denominator.

Proper Fractions.
- $\frac{1}{2}$ is the one half of any thing.
- $\frac{2}{3}$ is two third parts of any thing.
- $\frac{3}{4}$ is three quarters of any thing.
- $\frac{4}{5}$ is four five parts of any thing.

Fractions of Fractions.

Fractions of Fractions have commonly this Word (of) *between them, as* $\frac{2}{3}$ *of* $\frac{3}{4}$, *that is, two thirds of three quarters.*

If

Improper Fractions.

If the *Numerator* be greater than the *Denominator*, the Fraction is improper, and containeth a Unit or Units, or ſome Part or Parts of the *Denominator*, as $1\frac{5}{4}$ is three Integers or whole, and three quarters; but when the *Numerator* and the *Denominator* are alike, they make a Unit.

Though *Addition* in whole Numbers be immediately after *Numeration*, yet in *Fractions* it is not ſo, becauſe there are, as here you ſee, *Fractions* of ſeveral ſorts, which muſt of neceſſity be reduc'd into one Denomination, before they can be added. Therefore, to avoid diſorder, I ſhall firſt ſhew what this Reduction of Fractions is; ſecondly, how to reduce all Fractions to one Denomination or Likeneſs.

CHAP. VIII.

REDUCTION of FRACTIONS.

What Reduction is.

REduction *teaches to bring Integers into Fractions, or contrary; yea, Fractions of divers Denominations into one, or what you liſt.*

I would have reduc'd $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$ of an Ell, or what you pleaſe, into one Denomination.

To reduce proper Fractions.

For the effecting of this, and all other of this kind, multiply all the Denominators together (which Product take for a common Denominator) as 2 time 3 is 6, and 4 times 6 is 24, your Denominator.

Then multiply the Numerator of the firſt in all the other Denominators, except its own Denominator; as once 3 is 3, 3 times 4 is 12, which take for a new Numerator to the firſt Fraction.

Then multiply the ſecond Numerator in all the Denominators except its own; as 2 times 2 is 4, and 4 times 4 is 16, which likewiſe take for a new Numerator to the ſecond.

Then multiply the third Numerator in all the Denominators except its own; as 3 times 3 is 9, 2 times 9 is 18, which alſo place for a new Numerator to the Third, and your Work ſtandeth thus:

12	16	18
$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$

24

So that —— $\frac{12}{24}$ $\frac{16}{24}$ $\frac{18}{24}$
are equal to $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$

II. *To*

II. *To reduce Fractions of Fractions into one Denomination.*

Multiply all the Numerators together, and take the Product thereof for a new Numerator; and likewise multiply all the Denominators together, and make the Total a Denominator.

Example. $\frac{6}{\frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4}}$

24

III. *To reduce improper Fractions into whole Numbers.*

Divide the Numerator by the Denominator.

Example. $2\frac{3}{4}$ 3

$2\not{3}$ (5 $\frac{3}{4}$

4

IV. *To reduce a whole Number into an Improper Fraction.*

Let the Number given be the Numerator and 1 the Denominator.

Example. Reduce 13 Integers into an improper Fraction: *facit* $\frac{13}{1}$

V. T

V. *To reduce a whole Number joined with a Fraction into one Denomination.*

Multiply the whole Number into the Denominator of the Fraction, adding thereto the Numerator.

Example. 5 Yards and $\frac{3}{4}$ *faeit* $\frac{23}{4}$.

VI. *To reduce a greater Fraction into a leſſer Term, equivaluable to it ſelf.*

Take the half of the Numerator, and half of the Denominator, as oft as you can, and when you can take the half no further, take the one third, or the one fourth, or the one fifth, *&c.* both of the Numerator and Denominator.

Example.

I would abbreviate $\frac{24}{120}$ | $\frac{12}{60}$ | $\frac{6}{30}$ | $\frac{3}{15}$ | $\frac{1}{5}$ |

Take the half of 24, which is 12, then the half of 120, which is 60; again, the half of 12, which is 6, and the half of 60 is 30; then the half of 6 is 3, and the half of 30 is 15: Here you ſee that the half cannot be taken both of the Numerator and Denominator; therefore try whether it will be abbreviated by 3, as thus: How

many times 3 in 3, once, then how many times 3 in 15, 5 times. So that $\frac{1}{5}$ is in the loweſt Denomination, yet it retains the ſame Value; for $\frac{1}{5}$ is equal to $\frac{24}{120}$.

A ſecond kind of Abbreviation.

Though by the former Rule all Fractions might be abbreviated, yet when you cannot take $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, or $\frac{1}{9}$, *&c.* they ſeem more tedious by this ſecond Way as may appear.

I would have this Sum abbreviated, $\frac{3077}{4186}$ into a leſſer Fraction.

For the reducing whereof, divide the Denominator by the Numerator, and the Remain of the Diviſion will be 1086, by which divide the former Diviſor 3077, and there will remain 905, by which divide your laſt Diviſor 1086, and there will remain 181, by which Remains likewiſe divide the Diviſor 905, and there will remain 0.

Where note, that having divided your Denominator by the Numerator, and the Diviſor of every Diviſion ſo often by the Remains that nothing will remain; then that laſt Diviſor will divide both your Numerator and Denominator of your Fraction:

As

As in the Example,
$\frac{3}{4}\frac{0}{1}\frac{7}{6}\frac{7}{3}$ *facit* $\frac{1}{2}\frac{7}{3}$, equal to the former.

How to reduce or alter any Fraction to another Denomination, as Money, Weight, or Measure, &c.

Multiply the Numerator by such a new Denominator or Number which you intend, dividing the Product by the former Fractions Denominator, whose Quotient shall be Numerator to the Denominator last chosen.

Example.

What is $\frac{2}{3}$ of 12 *d*?

$\frac{2}{24}$ 24 (8 *d.*
3

What is $\frac{5}{9}$ of 20 Shillings?
What is $\frac{7}{8}$ of a *Flemish* Ell?
What is $\frac{5}{7}$ of a Yard?
What is $\frac{5}{8}$ of a Tun of Wine?
What is $\frac{6}{7}$ of a Tun of Iron?
What is $\frac{9}{10}$ of a Hogshead of Sack?
What is $\frac{4}{5}$ of a Dollar at 4 *s.* 8 *d*?
Facit 44 *d.* $\frac{4}{5}$

6
What is $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of 5 Shillings?
24

Reduce Fractions of Fractions to one ſingle Fraction, and work as before.

$\frac{6}{3\,4}$ | $\frac{3}{1\,2}$ | $\frac{1}{4}$ of $\frac{1}{\cancel{5}\,4}$ (1 *s.* and $\frac{1}{4}$.

What is $\frac{4}{5}$ of a Dollar at 4 *s.* 8 *d*?

Facit 44 *d.* $\frac{4}{5}$.

CHAP. IX.

Addition of Fractions.

1. ADdition of Fractions is the putting of two or more broken Numbers into one Sum, or principal Fraction.

In this Rule, and the next, obſerve, that all Fractions whatever, proper or improper, muſt be of one Denomination, or reduced thereto by the former Rules.

2. Being of one Denomination only, add all the Numerators together, which Total ſubſcribe for a new Numerator over the common Denominator.

Example.

Add $\frac{2}{5}$ and $\frac{1}{5}$ of any thing together.

$\frac{2}{5}$ and $\frac{3}{5}$ *facit* $\frac{5}{5}$, or one whole one.

326

60	80	90	96

Add $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ & $\frac{4}{5}$ together, *facit* $\frac{326}{120}$.

120

Reduce them into one Denomination by the firſt Rule of Reduction; then add the Numerators, as in the laſt Example.

A more ſpeedy Way.

Multiply all the Denominators that differ in Quantity each from other, and the Total thereof ſhall be the common Denominator and Dividend to each particular Denominator, whoſe Quotient multiply into its Numerator, and ſet it directly againſt its own Fraction, and, in fine, add them all up, which Total ſhall be a new Numerator unto the common Denominator; and add as many Integers as they make to the whole Numbers.

Example.

lb	
620 $\frac{1}{4}$	3
271 $\frac{1}{3}$	4
103 $\frac{1}{2}$	6
017 $\frac{3}{4}$	9
710 $\frac{1}{2}$	6
1723 $\frac{1}{3}$	$\frac{28}{12}$

(24 or 12

4
28 (2
22

III. *Yet a more ſhort Way.*

Caſt your Eye upon the Denominators, and imagine what Number will be divided by them all, and that ſhall be your common Denominator, and Dividend unto each particular Denominator; then work as before in the laſt Examples. (12)

Number 12 *will be divided by all the Denominators.*

$472\frac{3}{6}$	6
$315\frac{3}{4}$	9
$917\frac{1}{2}$	6
$106\frac{2}{3}$	8
$371\frac{1}{6}$	2
$125\frac{1}{4}$	3
$2308\frac{5}{6}$	$\frac{34}{12}$

10

34 (2

xx

IV. *Addition of Fractions of Fractions.*

Reduce your Fractions into a ſingle Fraction, according to the ſecond Rule in Reduction; then work as before.

Example. Add $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ unto $\frac{4}{5}$ of $\frac{6}{7}$

6	24	210	576

$\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ unto $\frac{4}{5}$ of $\frac{6}{7}$: $\frac{6}{24}$ $\frac{24}{35}$: $\frac{210}{576}$ $\frac{786}{840}$

24 | 35 | 840 *facit* $\frac{786}{840}$

V. *Ad-*

V. *Addition of improper Fractions.*

Reduce your Fractions into one Denomination, and work *ut ſupra.*

Example. Add $\frac{5}{4}$ and $\frac{7}{6}$

58

30	28	
$\frac{5}{4}$	$\frac{7}{6}$	*facit* $\frac{58}{24}$.

24

VI. *To add a ſingle Fraction unto a Fraction of Fractions.*

Example. Add $\frac{3}{4}$ and $\frac{1}{3}$ of $\frac{4}{5}$ together; $\frac{1}{3}$ of $\frac{4}{5}$ reduce into a ſingle Fraction, according to the ſecond *Section* in *pag.* 72. and work as before.

61

4	16	45	
$\frac{1}{3}$ of $\frac{4}{5}$	$\frac{4}{15}$	and	$\frac{3}{4}$ *facit* $\frac{61}{60}$.
15	60		

CHAP. X.

Subtraction of Fractions.

SUBTRACTION is the taking of one Fraction from another, a leſs from a greater, or an equal from an equal.

1. Becauſe Subtraction teacheth to take a leſſer Fraction from a greater, it will not be amiſs to ſhew you how to know the one from the other.

2. Thoſe Fractions are accounted the greateſt, whoſe Numerator multiplied by the Denominator of the other Fraction, maketh the greateſt Number.

And as in *Addition*, ſo here, all Fractions to be ſubtracted muſt be of one Denomination, or reduced thereunto.

II. *To ſubtract Fractions of one Denomination.*

Subtract one Numerator from the other, and ſet the Remain over the common Denominator.

Example.

Subtract $\frac{2}{5}$ from $\frac{3}{5}$ there remains $\frac{1}{5}$.

III. *To ſubtract a whole Number and a Fraction from a whole Number and a Fraction.*

Firſt, reduce your Fractions into one Denomination, then ſubtract the one Numerator from the other; and for the Integer ſubtract as you were taught in whole Numbers.

Example.

Received 30 *l.* $\frac{3}{4}$. Laid out 10 *l.* $\frac{1}{2}$.

2

6 4
$\frac{3}{4}$ $\frac{1}{2}$ Remain $\frac{2}{8}$ or $\frac{1}{4}$.

8

IV. *Another Way.*

Multiply the Denominators together, and let the Product be the common Denominator, which common Denominator divide by each particular Denominator, and multiply the Quotients by their Numerators, and set down their Products directly against its Fraction, and then subtract as if it were in whole Numbers.

As for Example.

Received —100 *l.* $\frac{5}{8}$ 25
Spent —— 93 *l.* $\frac{3}{5}$ 18

Remains — 7 : $\frac{7}{30}$

V. *When the Fraction to be subtracted, is greater than the Fraction you are to subtract from,*

Reduce them into one common Denominator (as you did in the last Example) and subtract the greatest Numerator from the common Denominator, and add the Remains to the Numerator of the less, which subscribe for a new Numerator unto the common Denominator; then carry one

to the next Integer, and ſubtract as in whole Numbers.

	l.	*s.*		*C.*		
Received—	5—	0	Bought—	16	$\frac{1}{4}$	7
Paid ——	3—	$\frac{2}{5}$	Sold ——	14	$\frac{3}{7}$	12
Remains —	1—	$\frac{3}{5}$	Remains	1	$\frac{23}{28}$	

VI. When Fractions of Fractions are to be ſubtracted, they muſt be reduced into ſingle Fractions, then ſubtracted as before.

Example. $\frac{1}{2}$ of $\frac{2}{3}$ to be ſubtracted from $\frac{3}{4}$ of $\frac{4}{5}$; being reduced into ſingle Fractions, they are $\frac{1}{3}$ and $\frac{3}{5}$.

4

5 9

$\frac{1}{3}$ $\frac{3}{5}$ Remain. $\frac{4}{15}$

15

CHAP. XI.

Multiplication of Fractions.

IN Multiplication of Fractions, whether they be proper, improper, mixt, or compound, they muſt likewiſe be reduced to ſingle Fractions: Multiply the Numerators therefore together, and the Product ſhall be a new Numerator; then multiply all the Denominators, and the Product thereof ſhall be the Denominator.

Ex.

Example.
Multiply $\frac{2}{3}$ by $\frac{3}{4}$ | $\frac{2}{3} \times \frac{3}{4}$ *facit* $\frac{6}{12}$ or $\frac{1}{2}$

It might ſeem ſomewhat ſtrange to young Learners, that $\frac{2}{3}$ of a Pound being multiplied by $\frac{3}{4}$ of a Pound, ſhould make but $\frac{1}{2}$: Therefore to inform them, I think meet to acquaint them, that as whole Numbers multiplied by whole Numbers do increaſe the Product, ſo Proper Fractions multiplied by proper Fractions do diminiſh the Product: For as 1 multiplied by 1 makes but 1, ſo that which is leſs than 1 being multiplied by that which is leſs than 1, muſt needs make leſs than either of them: Or thus,

$$\frac{\frac{2}{3}}{\frac{3}{4}} \quad \frac{6}{12}$$

To multiply Fractions of Fractions.

II. Reduce them into ſingle Fractions, then work as before.

Example. $\frac{3}{5}$ of $\frac{5}{6}$ by $\frac{1}{2}$ of $\frac{2}{3}$ being reduced they are $\frac{1}{2}$ and $\frac{1}{3}$, and being multiplied, *facit* $\frac{1}{6}$.

To multiply a whole Number and a Fraction together.

III. Multiply the Numerator by the whole Num-

Number, and divide the Product by the Denominator.

Example. Multiply 4 by $\frac{3}{4}$ $\times\times$ (3 *facit.*
4

To multiply a whole Number and a Fraction by a whole Number.

IV. Reduce the whole Number and Fraction into an improper Fraction, then work as before.

Example. 2 and $\frac{2}{3}$ by 4 *facit* $^{3}\frac{2}{3}$ or 10 $\frac{2}{3}$.

To multiply a whole Number and a Fraction by a whole Number and a Fraction.

Reduce each of them into an improper Fraction, and work as before in *Sect.* I.

Example. Multiply 3 and $\frac{1}{4}$ by 2 and $\frac{1}{3}$.
$^{1}\frac{3}{4}$ by $\frac{7}{3}$ *facit* $\frac{91}{12}$ or 7 $\frac{7}{12}$.

CHAP. XII.

Division of Fractions.

AS in Multiplication, so in this, all Fractions that are to be divided, must be reduced to single Fractions both for the Dividend or Divisor: Then set that Fraction which is the Dividend on the left

left hand, and that for Diviſor on the right hand; then multiply croſs wiſe the Numerator of the Dividend by the Denominator of the Diviſor, and ſubſcribe the Product for a new Numerator: Likewiſe multiply the Denominator of the Dividend by the Diviſor's Numerator, and the Product ſhall be a new Denominator.

Example.

What is the Quotient of $\frac{4}{5}$ divided by $\frac{3}{4}$?

Place your Fractions thus, with this X *Character between them, and work according to the Directions before given.* $\frac{4}{5} \times \frac{3}{4}$

$\frac{16}{15}$.

Facit $\frac{16}{15}$, or *one whole one, and* $\frac{1}{15}$.

I demand the Quotient of $\frac{2}{3}$ divided by $\frac{3}{4}$?

$\frac{2}{3} \times \frac{3}{4}$

Facit $\frac{8}{9}$

In the Diviſion of whole Numbers, the Dividend muſt be always greater than the Diviſor, otherwiſe you can make no Quotient. But in Diviſion of Fractions it is otherwiſe, as in the ſecond Queſtion propounded, $\frac{2}{3}$ to be divided by $\frac{3}{4}$; for $\frac{3}{4}$ is greater or more than $\frac{2}{3}$, yet it may be divided: For as the Multiplication of proper Fractions (as was ſaid before) doth diminiſh the Product, ſo Diviſion of proper Fractions doth increaſe the Quotient.

II. *To*

II. *To divide a whole Number by a Fraction.*

I demand the Quotient of 20 divided by $\frac{1}{2}$?

20 being the whole Number, convert it into an improper Fraction, by placing an Unit for a Denominator, and it ſtandeth thus:

$$\frac{1}{2} \text{ X } \frac{20}{1}$$

facit $\frac{40}{2}$

III. *To divide a whole Number and a Fraction by a whole Number and a Fraction.*

I demand the Quotient of 5 and $\frac{1}{2}$ divided by $3\frac{1}{4}$?

$$\frac{13}{4} \text{ X } \frac{11}{2}$$

facit $\frac{44}{26}$

IV. *To divide Fractions of Fractions.*

I demand the Quotient of $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ divided by $\frac{2}{3}$ of $\frac{1}{2}$?

Reduce the Dividend into one ſingle Fraction, and likewiſe the Diviſor; then work as before.

$$\frac{2}{8} \text{ X } \frac{6}{24}$$

facit $\frac{36}{48}$

CHAP.

CHAP. XIII.

The Rule of Three.

I. THe *Rule of Three* is commonly called *The Golden Rule*; and indeed it may rightly be ſo termed; for as Gold tranſcends all other Metals, ſo doth this Rule all others in Arithmetick.

II. Now for your better Information concerning it, you muſt obſerve, that there are three Numbers known, by which a fourth that is unknown may be found out, which bears like proportion to the third, as the ſecond doth to the firſt.

III Here alſo is to be noted, That if your Sums conſiſt of ſundry Denominations, then the firſt and third Numbers muſt be of the ſame Denomination, as alſo the fourth and the ſecond: As thus, If the firſt Number be Yards, the third likewiſe muſt be Yards; if the ſecond be Pence, then the fourth muſt be Pence.

IV. But the greateſt difficulty lieth in the ſtating the Queſtion.

Therefore obſerve firſt, That what you deſire to know or to be reſolv'd in the Queſtion, muſt be your third Number: and you have commonly theſe Words before it, as, *What coſt? How long? How broad? How much? How deep?* &c.

2. Your Queſtion being ſtated, bring your firſt and third Numbers into one Denomination.

3. Bring your ſecond into the leaſt Name mentioned, or as low as you deſire the Queſtion to be anſwered in.

4. Obſerve whether your third Number *requires more or leſs*; *if more*, then multiply the middle Number by the greater of the two Extremes, and divide by the leſſer, and the Quotient anſwereth the Queſtion.

But if it require *leſs*, then multiply the middle Number by the leſſer of the two Extremes, and divide by the greater.

Theſe two Words, *more* or *leſs*, being well obſerved, the Scholar will underſtand what he doth, and need not to make two diſtinct *Rules of Three*, as moſt do.

The four firſt Queſtions are ſtated four ſeveral ways, by which the one is a Proof of the other.

And

And thus you may eaſily work all the reſt, which will be advantageous to the Scholar, and likewiſe an eaſe to the Maſter; I ſhall therefore only give you the *Facits* of the following Queſtions.

If 6 Yards coſt 10 *s.* what 12 Yards?

10

120

XXO (20 *Shillings.*

6

If 12 Yards——20 *s.*——6 Yards?

20

XXO (10 *s.*

XXX

X

120

If 20 *s.* buy 12 Yards, what will 10 *s*?

12

120

XXO (6 *Yards.*

XO

If 10 *s.*——6 Yards——20 *s*?

6

120

XXO (12 *Yards.*

XOO

X

If

If 6 Men will be finiſhing a Piece of Work 10 Days, how long will 12 Men be doing the ſame?

Men. *Days.* *Men.*
6 —— 10 —— 12

10

60 — 60 (5 *Days.*
xx

If 12 Men —— 5 Days —— 6 Men?

5

60 — 60 (10 *Days.*
66

If 5 Days —— 12 Men —— 10 Days?

12

60 — 60 (6 Men.
xo

If 10 Days —— 6 Men —— 5 Days?

6

60 — x
60 (12 Men.
55

If 2 ℔ cost 9 *d.* $\frac{3}{4}$, what cost 2 C $\frac{1}{2}$?

4 — 39 *qrs.*

4 — 10 — 28 — 80 — 20 — 280 ℔.

39

2520
840

10920

If 280 ℔ —— 5460 *qrs.* —— 2 ℔?

2

10920

5460 (39 *qrs. facit.*

If 5460 *qrs.* —— 280 ℔ —— 39 *qrs.*

280

3120
78

10920

5460 (2 ℔. *facit.*

If

If 39 Qrs.——2 lb.——5460 Qrs?

2

10920

3 X (280 lb. *facit.*

X X X X

3 3 3 3

3 3

If I ſpend 476 *l.* 11 *s.* 10 *d.* a Year, I demand, how much that is one Day with another?

Days.	*l.*	*s.*	*d.*	*Day.*
If 365	476	11	10	1

20

9531

12

19062

9532

114382 *d.*

(1

X 2 (3

4 8 3 (7

X X 4 3 8 2 (313 *d.*

3 6 5 5 5

3 6 6

3

If 1 *Day*——313 *d.*——365 *d.*

313

1095
3657
10953
1

114382 *d.*

If 313 *d.*——1 *d.*——114382 *d.*

(1
x7 (3
xx40 (7
xxx438x (365 *days.*
3xxxxx
3xx
3

days.

If 114382 *d.*——365——313 *d.*

365

1565
18787
9393
1

114382

xxx438x (1 *d.*
xxx438x

At

At 15 *d.* $\frac{1}{4}$ *per* ℔. how many C. weight for 11 *l.* 11 *s.* 11 *d.*

Facit 1 C. $\frac{1}{2}$ 14 ℔. $\frac{30}{81}$.

If 9 Ells $\frac{1}{5}$ coſt 27 *s.* 5 *d.* what coſt 80 Pieces, each 25 Yards $\frac{1}{4}$, and 12 Pieces, each 19 Ells $\frac{3}{5}$?

Facit 275 *l.* 16 *s.* 8 *d.* $\frac{12}{23}$.

If 100 ℔. of Cloves coſt 88 *l.* 11 *s.* 10 *d.* and 1 C. weight of Mace 99 *l.* 10 *s.* 3 *d.* what coſt 3 ℥ one with another?

Facit 3 *s.* 3 *d.* $\frac{3147}{333}$.

If 1 Pair of Stockins coſt 10 Groats, how many dozen Pair ſhall I have for 100 Marks?

Facit 33 *dozen Pair* $\frac{1}{3}$.

If 7 ℔ $\frac{1}{2}$ of Currants coſt 2 *s.* 7 *d.* what coſt 3 Butts, each 15 C. $\frac{1}{2}$ 14 ℔ groſs, Tare 39 ℔ *per* Butt?

Facit 88 *l.* 8 *s.* 0 *d.* $\frac{2}{5}$.

If 5 Ells $\frac{3}{5}$ of Cambrick coſt 21 *s.* 8 *d.* what coſt 120 Pieces, *viz.*

				Ells.	*qrs.*	*na.*
Number	A.	30	*qt.*	272	2	1
	B.	50	*qt.*	401	3	1
	C.	40	*qt.*	341	1	3
				1015	2	1

Facit 196 *l.* 8 *s.* 9 *d.* 3 *q.* $\frac{4}{7}$.

Sold

Sold 5 Bags of Pepper, each, *viz.* Tare 43 ℔. *per* Bag, and Tret 4 ℔ *per* 104 ℔. at 15 *d.* $\frac{1}{4}$ *per* ℔ neat; what comes it to neat?

Alſo I demand how many Dollars of 4 *s.* 8 *d.* apiece will pay for the neat Weight?

			C.	qr.
Number	G.	*qt.*	3	2
	H.	*qt.*	4	1
	L.	*qt.*	5	3
	M.	*qt.*	2	1
	O.	*qt.*	3	3
			19	2

facit 515 *Doll.* $\frac{174}{234}$ or $\frac{87}{117}$.

Sold 10 Packs of Cloth, each Pack *qt.* 10 Clothes, and each Cloth 39 Yards, at 11 *s.* 1 *d. per* Yard; I demand how much it comes to in all? *Facit* 2323 *l.* 15 *s.* 0 *d.*

	C.	qrs.	℔.
Bought of ſeveral Perſons	433	3	17

of Currants, at 4 *d. per* ℔. to whom I have ſold 519 C. 3 *qrs.* 7 ℔. of Sugar at 2 *d.* $\frac{3}{4}$ *per* ℔. Now I would know what remains for me to pay, they having taken the Sugar in part of Payment.

	l.	*s.*	*d.*
	809	19	00
	667	01	10 $\frac{1}{4}$
facit Rem. to pay	142	17	01 $\frac{3}{4}$

A Merchant died, being indebted to ſeveral Creditors, (*viz.*) to *A.* 40 *l.* to *B.* 56 *l.* to *C.* 80 *l.* Now he being dead, his Eſtate was worth but 30 *l.* I demand what each Man muſt have?

A — 6 $\frac{144}{178}$
B — 9 $\frac{96}{178}$
C — 13 $\frac{112}{178}$

Facit 30 *l.*

Bought 100 Pieces of Cloth for 411 *l.* 11 *s.* 11 *d.* What containeth the Cloth, the Yard being valued at 7 *s.* 8 *d?*

Facit 1073 *Yards* $\frac{67}{92}$

If 1 Pound of *Virginia* Tabacco coſt 10 *d.* $\frac{1}{31}$ what coſt 3 Hogſheads, weight 17 C. $\frac{1}{2}$ 12 ℔. groſs, Tare 37 ℔. *per* Hogſhead, and 4 ℔. *per* 104 ℔. Tret?

Facit 78 *l.* 6 *s.* 3 *d.*

Alſo I demand how many Duckets of 3 *s.* 9 *d.* $\frac{1}{4}$ will pay for the neat Weight?

Facit 413 *Duckets* $\frac{51}{111}$

A Merchant hath owing 357 *l.* 9 *s.* and his Debtor doth agree with him to pay him for every Pound 13 *s.* 5 *d.* I demand what muſt he pay?

Facit 239 *l.* 15 *s.* 9 *d.* $\frac{9}{20}$.

A Man died having three Sons and two Daughters; he gave to the eldeſt Son 2000 *l.* to the ſecond 1900 *l.* to the third 1000 *l.* to the eldeſt Daughter 700 *l.* to the ſecond 500 *l.* Now, he being dead, his Eſtate was worth but 2020 *l.* I demand what each Child muſt have?

Eldeſt Son	662 $\frac{18}{61}$
Second Son	629 $\frac{11}{61}$
Third Son	331 $\frac{8}{61}$
Eldeſt Daughter	231 $\frac{49}{61}$
Second Daughter	165 $\frac{35}{61}$
	Facit 2020

If I buy a Piece of Cloth for 84 *l.* 11 *s.* and I ſell the Ell *Eng.* for 7 *s.* 8 *d.* I demand how many Yards were contained in the ſaid Piece?

Facit 275 *Yards* $\frac{1}{2}$ *and* $\frac{19}{23}$ *of a qr.*

Sold four Parcels of Sugar, containing as followeth:

		C.	qrs.	lb.		
The first	containing	86	2	21	Tare	84
The second	containing	76	1	12	Tare	56
The third	containing	98	3	11	Tare	92
The fourth	containing	75	1	17	Tare	85

at 35 *s. per* C. neat.

Facit 585 *l.* 6 *s.* $\frac{28}{112}$ or 3 *d.*

If 50 C. 3 Qrs. 15 lb. of Sugar cost 21 *l.* 19 *s.* 11 *d.* how many Chests of 86 C. $\frac{1}{2}$ shall I have for 1000 Marks and 486 *l.*

Facit 30 *Chests and* $\frac{8009}{9688}$ *of a Chest.*

If 5 Peny-weight of Silver cost 7 *d.* $\frac{1}{4}$, what cost 3 Ingots, each 11 lb. $\frac{1}{2}$?

Facit 50 *l.* 0 *s.* 6 *d.*

If a Gentleman hath 960 *l.* 12 *s. per annum*, how much may he spend one day with another to lay up 100 Marks at the Years end to purchase withal?

Facit 146 *Groats* $\frac{346}{365}$ *per diem.*

A Merchant bought 376 Clothes, at 11 *l.* 11 *s.* 1 *d. per* Cloth, which he shipp'd for *Spain* to have Returns from thence, the one half in Wine, at 28 *l. per* Tun, and the other half

half in Sugar, at 27 *s. per* C. weight; I demand how much of each muſt be returned for the ſaid Clothes?

77 *Tuns* $\frac{971}{1680}$ *of Wine.*
1609 C. 2 lb. $\frac{62}{81}$ *of Sugar.*

There are 101 Pipes of Oil that contain 12307 Gallons, I would know how much 59 Pipes and $\frac{1}{2}$ will contain, and what it will amount to at 36 *l. per* Tun, the Tun being 236 Gallons?

Facit 1105 *l.* 18 *s.* 7 *d.* $\frac{172}{236}$.

A Merchant bought 9870 C. $\frac{1}{2}$ of Lead, which coſt 7 *l.* 8 *s.* 5 *d. per* Fother, (or 19 C. $\frac{1}{2}$) the Charges upon the ſame amounts to 125 *l.* 12 *s.* which he ventures for *France*, to receive from thence *French* Wine at 13 *l.* 10 *s. per* Hogſhead: I demand how many Hogſheads he muſt receive for Content?

Facit 287 *Hogſheads* $\frac{176}{252}$

A Grocer delivered 7657 lb. of Tabacco in the Roll, to be cut and dried, and when it came home it held out but 5839 lb. I demand what is loſt in the Pound; and alſo ſuppoſing it coſt in the Roll 8 *d.* $\frac{1}{2}$ *per* Pound,

and the Cutting 1 *d.* $\frac{1}{4}$ *per* Pound, I demand what it now ſtands him in?

1 *l.* ——— 9 *d.* $\frac{3}{4}$ ——— 7657 *l.*

It ſtands him in 311 *l.* 1 *s.* 3 *d.* $\frac{3}{4}$

7657 *l.* ——— 1818 *l.* ——— 1 *l.*

Facit 3 3 $\frac{61\,17}{7657}$ loſt *per* Pound.

CHAP. XIV.

The Rule of Three in Fractions.

AS in the Rule of Three in whole Numbers, I laid down certain Principles both for the better diſcovering, and more eaſie working thereof; ſo in this of Fractions, I ſhall endeavour to make all things as plain and familiar as may be.

And firſt, becauſe many Queſtions ſeem very ambiguous, whether they belong to the Rule of Three direct, or indirect:

That you may be rightly informed concerning them, caſt your Eye upon the third Number in the Queſtion, and ſee whether it be greater or leſſer than the firſt Number.

But if you cannot eaſily apprehend which is the greater or leſſer, then work according to the ſecond Section in *pag.* 80.

What

What Questions belong to the Rule of Three direct.

If the third Number be greater than the firſt, and the Anſwer required be greater than the ſecond, it is upon the Rule of Three direct.

And likewiſe if the third Number be leſs than the firſt, and the Anſwer required be leſs than the ſecond, it belongs to the ſame Rule.

What Questions belong to the Rule of Three indirect.

But if the third Number be leſs than the firſt, and the Anſwer required be greater than the ſecond, it is pertaining to the indirect Rule.

And if the third Number be greater than the firſt, and the Anſwer required leſs than the ſecond, it is according to the ſame Rule.

Having thus found out to what Rule it belongs, firſt conſider diligently, *viz.* whether the firſt and third Numbers be both of one Denomination; if not, they muſt be reduced into the leaſt of theſe Denominations.

2. That your ſecond being a compound Fraction, muſt be reduced into the loweſt or leaſt Name mentioned.

The Operation of the Rule of Three direct.

Multiply the Denominator of the first Fraction into the Numerator of the second and third, and the Total thereof shall be the Dividend.

Multiply also the Numerator of the first Number by the Denominator of the second, and that Product by the Denominator of the third, and the Total shall be the Divisor.

The Operation of the Rule of Three indirect.

But when the Questions belong to the indirect Rule, multiply the Numerator of the first and second together, and the whole thereof by the Denominator of the third, and the Product shall be the Dividend.

Multiply also the Denominators of the first and second together, and the Total thereof by the Numerator of the third, and the Product that ariseth therefrom shall be the Divisor.

Example.

If $\frac{2}{5}$ of an Ell coſt $\frac{2}{3}$ of a *l.* what coſt $\frac{4}{5}$?

$\frac{2}{10}$ $\frac{4}{40}$ *Dividend.* $\frac{2}{6}$ $\frac{5}{30}$ *Diviſor.*

(1 : *l.*
4 (0 (1 $\frac{1}{3}$ *facit.*
30

$\frac{4}{5}$ Ell——— 1 *l.* $\frac{1}{3}$ ———$\frac{2}{5}$ Ell?

$\frac{4}{20}$ $\frac{2}{40}$ *Dividend.* $\frac{4}{3}$ $\frac{4}{12}$ $\frac{5}{60}$ *Diviſor.*

$\frac{40}{60}$ | $\frac{2}{3}$ *l. facit.*

$\frac{2}{3}$ $\frac{2}{6}$ $\frac{4}{24}$ *l.*———$\frac{2}{5}$ $\frac{2}{10}$ $\frac{3}{30}$ Ell———1 *l.* $\frac{1}{3}$ $\frac{4}{3}$?

$\frac{24}{30}$ | $\frac{12}{15}$ | $\frac{4}{5}$ Ell *facit.*

1 *l.* $\frac{1}{3}$ $\frac{4}{3}$ $\frac{4}{12}$ $\frac{2}{24}$ ——— $\frac{4}{5}$ $\frac{4}{20}$ $\frac{3}{60}$ Ell———$\frac{2}{3}$ *l.*?

$\frac{24}{60}$ | $\frac{12}{30}$ | $\frac{6}{15}$ | $\frac{2}{5}$ Ell *facit.*

For proof of theſe and the following Queſtions, the ſame Method is to be obſerved.

ſerved as in the Rule of Three in whole Numbers.

If $\frac{1}{2}$ lb. coſt $\frac{3}{4}$ of a Shill. what coſt $\frac{3}{4}$ of a lb?

$\frac{3}{6}$ $\frac{4}{16}$

$\frac{3}{1\,3}$ (2 *s.*

x8 (1 $\frac{1}{8}$ *facit.*

x6

If $\frac{3}{4}$ lb. coſt 1 *s.* $\frac{1}{8}$, what coſt $\frac{1}{2}$ lb?

$\frac{9}{3\,6}$

$\frac{9}{8}$

$\frac{3}{2\,4}$

$\frac{2}{48}$ | $\frac{36}{48}$ | $\frac{18}{24}$ | $\frac{9}{12}$ | $\frac{3}{4}$ *of a Shill.*

If $\frac{3}{4}$ of a Shill. buy $\frac{1}{2}$ lb. what will 1 *s.* $\frac{1}{8}$?

$\frac{9}{3\,6}$ $\frac{3}{6}$ $\frac{9}{8}$

$\frac{8}{48}$

$\frac{36}{48}$ | $\frac{18}{24}$ | $\frac{9}{12}$ | $\frac{3}{4}$ *of a* lb.

If 1 *s.* $\frac{1}{8}$ —— $\frac{3}{4}$ lb. —— $\frac{3}{4}$ *s*?

$\frac{9}{8}$ $\frac{9}{3\,6}$

$\frac{3}{2\,4}$ $\frac{4}{1\,44}$

$\frac{3}{72}$

$\frac{72}{144}$ | $\frac{36}{72}$ | $\frac{18}{36}$ | $\frac{1}{2}$ *of a* lb.

To prevent Diſcouragement to young Scholars in the Queſtions of this Rule, which indeed are ſomewhat intricate, I adviſe them to turn to the Rule of Three

Three in whole Numbers, and exerciſe themſelves well therein, and eſpecially in ſuch Queſtions as are moſt plain and eaſie, till they throughly underſtand the Nature of the Rule; by means whereof all other Queſtions will be more eaſily wrought, be they never ſo difficult.

If 6 Yards and $\frac{1}{2}$ coſt 8 Shillings, what coſt 9 Yards and $\frac{1}{3}$?

Facit 11 *s.* $\frac{1}{3}\frac{9}{9}$.

If 1 Dollar be 56 Pence $\frac{3}{5}$, what 500 Dollars?

1—56 *d.* $\frac{3}{5}$—500 *facit* 117 *l.* 18 *s.* $\frac{1}{3}$.

If 2 Ounces and $\frac{1}{2}$ coſt 16 *s.* 5 *d.* what coſt $\frac{3}{4}$ $\frac{7}{3}$?

Facit 59 *d.* $\frac{1}{10}$

When the Buſhel of Wheat is ſold for 6 *s.* $\frac{2}{3}$, the Half-peny white Loaf ſhall weigh 5 $\frac{7}{3}$. $\frac{11}{12}$: I demand how much it ought to weigh when the Buſhel is ſold for 7 *s.* $\frac{1}{2}$?

6 *s.* $\frac{2}{3}$—5 $\frac{7}{3}$. $\frac{11}{12}$—7 *s.* $\frac{1}{2}$

Facit 5 $\frac{7}{3}$. $\frac{1}{2}$

If 1 Yard coſt 9 *s.* what coſt 4 Yards $\frac{5}{8}$?

Facit 43 *s.* $\frac{1}{2}$.

If 3 Ells $\frac{1}{4}$ coſt 15 *d.* $\frac{1}{4}$, what coſt 6 Ells $\frac{3}{4}$?

Facit 2 *s.* 7 *d.* $\frac{35}{52}$.

If $\frac{3}{4}$ of a Yard coſt $\frac{4}{5}$ of a *l.* what coſt $\frac{11}{13}$ of a Yard?

Facit 10 *s.* $\frac{10}{351}$.

If 3 Yards and $\frac{5}{11}$ coſt 4 *l.* 14 *s.* $\frac{24}{45}$, what coſts $\frac{6}{7}$ of an Ell *Flemiſh*?

$6\frac{03}{11}$ $4\frac{254}{45}$ $7\frac{2}{7}$ *Facit* 17 *s.* $\frac{113328}{19152}$.

If 1 ℔. coſt 6 *d.* $\frac{1}{3}$, what coſt 4 *l.* $\frac{5}{8}$?

Facit 30 *d.* $\frac{11}{18}$.

If 1 Ell $\frac{4}{5}$ coſt 9 *s.* $\frac{7}{8}$, what coſt 1 Yard?

Facit 4 *s.* $1\frac{7}{8}$.

I lent my Friend $\frac{5}{8}$ of a *French* Crown for three Weeks, that he ſhould do as much for me another time: but when I came to borrow of him, he could lend me but $\frac{3}{5}$ of a Crown: I demand how long time I muſt keep his Money to requite my former Kindneſs?

Facit 4 *Weeks* $\frac{1}{8}$.

If

If 1 Piſtolet be 5 *s.* $\frac{9}{10}$, what ſhall 430 be? Thus:

1 —— 5 *s.* $\frac{9}{10}$ —— 430 *facit* 126 *l.* 17 *s.*

If 13 ℔. coſt me 3 *l.* how many ℔. ſhall I have for 97 *d?*

Facit 1 *l.* $\frac{54}{72}$.

If $\frac{3}{4}$ ℔. coſt 9 *d.* $\frac{3}{4}$, what coſt 6 ℔. 9 ℥. $\frac{1}{4}$?

Facit 342 $\frac{1}{16}$.

If 5 Yards of Velvet coſt 4 *l.* 3 *d.* $\frac{1}{4}$, what coſt 4 Yards $\frac{6}{7}$?

Facit 3 *l.* 17 *s.* 11 *d.* 2 *qrs.* $\frac{32}{56}$.

If 1 C. $\frac{5}{7}$ coſt 4 *l.* 12 *s.* what coſt $\frac{5}{8}$ C?

$\frac{12}{7}$ —— 92 *s.* —— $\frac{5}{8}$ *facit* 33 *s.* $\frac{13}{32}$.

If 1 C. coſt 11 *l.* $\frac{8}{110}$, what coſt 4 ℥ $\frac{1}{4}$?

$\frac{71}{4}$ ℥. —— $\frac{1218}{110}$ *l.* —— $\frac{17}{4}$ ℥.

If $\frac{3}{7}$ of an Ell coſt 1 *l.* 2 *s.* what coſt $\frac{5}{6}$?

Facit 32 *s.* 1 *d.*

If 10 Ells coſt 3 *l.* $\frac{3}{5}$, what coſt 1 Yard?

$\frac{50}{5}$: $\frac{18}{5}$: $\frac{4}{5}$ or 50 — 18 —

If $\frac{1}{4}$ C. coſt $\frac{6}{11}$ of *l.* what coſt 1 C. $\frac{6}{7}$?

$\frac{1}{4}$ —— $\frac{6}{11}$ —— $\frac{13}{7}$ *facit*

If $\frac{3}{8}$ of C. coſt $\frac{6}{13}$ ℔. what will 3 *s.* $\frac{7}{8}$ buy?

$\frac{120}{13}$ ——— $\frac{3}{8}$ C. ——— $3\frac{1}{8}$ *s. facit.*

If $\frac{5}{6}$ of a Yard of Cloth in length, and 1 Yard $\frac{3}{4}$ broad, make a Child's Coat, I demand how much Stuff will make the ſame Child a Coat, when the Stuff is but $\frac{3}{4}$ of a Yard broad?

7 ——— $\frac{5}{6}$ ——— 3 *facit* 1 *Yard* $\frac{17}{18}$.

If 8 ℔. $\frac{3}{4}$ coſt 2 *l.* 11 *s.* $\frac{3}{4}$, how many ℔. ſhall I buy for 4 *l.* $\frac{1}{8}$?

Facit

If $\frac{3}{7}$ of 1 C. coſt $\frac{15}{16}$ of a *l.* what coſt $\frac{1}{5}$ of a Pound?

Facit

If $\frac{5}{7}$ of an ℥. coſt $\frac{11}{12}$ of a Peny, how much ſhall I buy for $\frac{6}{11}$ of 20 *s*?

Facit

If $\frac{12}{13}$ of a Pound coſt $\frac{7}{11}$ of a *l.* how many Pounds ſhall I have for 2 *l.* 7 *s.* 3 *d.* $\frac{1}{2}$?

Facit

How many Yards are bought for 142 *l.* 11 *s.* 2 *d.* when the $\frac{1}{2}$ of $\frac{3}{4}$ of a Yard coſt 6 *s.* $\frac{5}{8}$?

Facit

If

If 1 C. $\frac{3}{4}$ 12 ℔. $\frac{1}{3}$ coſt 2 *l.* $\frac{5}{6}$, what coſt $\frac{7}{9}$ of an $\frac{7}{3}$?

Facit $\frac{3}{5}\frac{5}{4}\frac{7}{0}\frac{3}{0}\frac{5}{0}\frac{7}{0}$.

If 26 ℔. at *Antwerp* be 27 ℔. $\frac{7}{8}$ at *London*, how many Pounds at *Antwerp* are 56 ℔. at *London*?

Facit $52\frac{5}{2}\frac{2}{3}$.

If 8 Ells at *Antwerp* be 5 Ells $\frac{1}{5}$ at *London*, how many Ells at *Antwerp* are 150 Ells $\frac{7}{11}$?

Facit 231 Ells $\frac{107}{143}$.

If $3\frac{1}{2}$ times $3\frac{1}{3}$ ℔. coſt $1\frac{1}{2}$ times $1\frac{1}{2}$ *l.* what ſhall amount unto $\frac{1}{2}$ times $\frac{1}{2}$ of the $\frac{1}{3}$ of 12 *l.* $\frac{1}{4}$?

$\frac{49}{4}$——$\frac{9}{4}$——$\frac{49}{48}$ *facit* $\frac{147}{184}$ of a *l.*

If $\frac{1}{3}$ leſs $\frac{1}{8}$ ℔. coſt $2\frac{1}{4}$ *l.* and the $\frac{1}{2}$ of $\frac{7}{8}$ ℔. what ſhall 10 ℔. leſs $\frac{1}{5}$ and $\frac{1}{4}$ of $3\frac{1}{2}$ ℔. amount unto?

$\frac{1}{8}$——$\frac{172}{64}$——$\frac{337}{40}$ *facit* 135—17—0—3

If a *French* Crown be worth 52 *d.* $5\frac{1}{2}$ *Sterl.* how many muſt be received for 100 $\frac{11}{l.}$ $\frac{7}{9}$ *Sterl.*

Crown.

$\frac{115}{22}$ *d.*——$\frac{1}{1}$——$72560\frac{0}{3}$

Facit 460 Cr. $\frac{44}{63}$.

When

When $\frac{1}{5}$ of 5 Ells leſs $\frac{1}{5}$ of an Ell coſt $\frac{1}{8}$ of $9\frac{1}{2}$ *l.* leſs $\frac{1}{8}$ of a *l.* what then ſhall $\frac{1}{8}$ of 6 Ells leſs $\frac{1}{8}$ of an Ell?

$\frac{4}{5}$—$\frac{17}{16}$—$\frac{5}{8}$ *facit* $1\frac{41}{384}$ *l.*

If $\frac{2}{3}$ of 20 ℔. coſt 36 *l.* leſs $\frac{3}{4}$ of 30 *l.* I demand to how much $\frac{5}{8}$ of 40 ℔. and $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$ will amount unto?

$\frac{40}{3}$: $\frac{27}{2}$: $25\frac{38}{72}$ *facit* $35\frac{221}{320}$ *l.*

If an Ingot of Silver whoſe Weight is 60 ℔. $\frac{5}{7}$ be better $16\,\mathfrak{Z}\,\frac{5}{9}$, I demand the Standard Weight of the Ingot, alſo the Betterneſs: *Note*, that the Standard is $11\,\mathfrak{Z}\,2$ *dwt.* Firſt, ſubtract the Standard-weight from the Betterneſs, then it follows:

$\frac{111}{10}$: $\frac{491}{90}$: $\frac{5100}{7}$

$\mathfrak{Z}$

$358\frac{202}{2331}$ *Betterneſs.*

$728\frac{1332}{2331}$ *Weight of the Ingot.*

$1086\frac{1534}{2331}$ *Standard Weight in Ounces.*

℔. $\mathfrak{Z}$. *dwt.*

90 : 6 : $13\frac{377}{2331}$ *facit.*

An Ingot of Silver, Weight $47\frac{3}{4}$ ℔. and is worſe $14\frac{1}{8}\,\mathfrak{Z}$. I demand the Worſeneſs of the Ingot, alſo the Standard Weight?

$\frac{111}{10}$: $\frac{46}{15}$: $57\frac{3}{1}$

℔. 13—2 $\mathfrak{Z}$— 6 *dwt.* $\frac{14}{111}$ *Worſeneſs facit.*

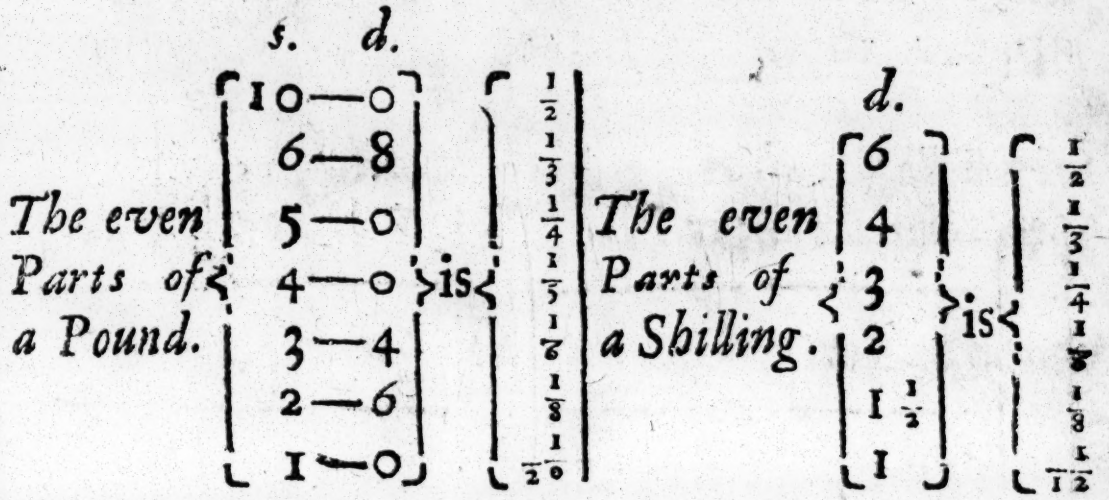
℔. 34—6 $\mathfrak{Z}$—13 *dwt.* $\frac{97}{111}$ *Standard facit.*

CHAP.

CHAP. XV.

RULES of PRACTICE.

Tables of Practice.



BEfore the Learner can well proceed further, he muſt get theſe Tables very perfectly by heart; I might puzzle his Head with ſome others, which, becauſe I conceive would be troubleſom and burdenſom to his Memory, therefore I ſhall omit them, and obſerve this plain and eaſie Method following.

2	12	24
3	12	36
4	12	48
5	12	60
6	12	72
7	12	84
8	12	96
9	12	108
10	12	120
11	12	132
12	12	144

And

And first I shall begin with the even Parts of a Shilling.

I. When the Price is an even Part of a Shilling, consider what Part of a Shilling it is; which being found, divide the Sum propounded by it, and the Quotient will be Shillings; as in these six Examples following will appear.

	Ells.	*d.*			lb.	*d.*	
½	8468	at 6 *per* Ell.		⅙	3618	at 2 *per* lb.	
	423	4			60	3	
	211-14—0 *facit.*				30—3 *facit.*		
					Yards.	*d.*	
⅓	867	at 4 *d. per* Ell.		⅛	2760	at 1 ½ *per Yd.*	
	28	9			34	5	
	14-9-0 *facit.*				17—5 *facit.*		
	lb.				lb.	*d.*	
¼	276	at 3 *d. per* lb.		1/12	4896	at 1 *per* lb.	
	6	9			40	8	
	3—9 *facit.*				20—8 *facit.*		

Having

Having gone thus far upon thoſe even Parts of a Shilling that are moſt eaſie, I muſt entreat the Learner to turn back to a Farthing, an Half-peny, Three-farthings, *&c.* the other Parts of a Shilling.

II. When the Price is Farthings, or Half-pence, bring the given Sum into Pence, and work as before in the laſt Queſtion; but when they are uneven Parts, as Peny-farthing, Peny-three-farthings, Two-pence-farthing, or the like, begin firſt with the even Parts of a Shilling: As for inſtance, 6396 Ells at 5 Farthings *per* Ell; work firſt for the Peny, as before; then conſider, if at the price of a Peny they come to ſo many Shillings, then the Farthing muſt be the fourth part of them, which being taken and added together, your Work is done,

	Ells.		*Ells.*
$\frac{1}{4}$	420 at $\frac{1}{4}$ *d. per Ell.*	$\frac{1}{2}$	716 at $\frac{1}{2}$ *d. per Ell.*
$\frac{1}{2}$	105	$\frac{1}{2}$	358
	8—9 *d. facit.*	2	9—10 *d.*
			1—9—10 *facit.*

Ells.

	Ells.	*d.*
$\frac{1}{2}$	6396 at $\frac{3}{4}$ *per* Ell.	
$\frac{1}{1\frac{1}{2}}$	3198	
$\frac{1}{2}$	266	6 *d.*
	133	3
	39	9-9
	19	19—9 *facit.*
$\frac{1}{1\frac{1}{2}}$	5712 at 1 *d.* $\frac{1}{4}$	
$\frac{1}{4}$	476	
	119	
	59	5
	29-15 *facit.*	

	Ells.	*d.*
$\frac{1}{8}$	7225 at 1 $\frac{3}{4}$ *per* Ell.	
$\frac{1}{6}$	903	1 $\frac{1}{2}$
	150	6 $\frac{1}{4}$
	105 | 3	7 $\frac{3}{4}$
	52--13	7 $\frac{3}{4}$ *facit.*

III. When any thing doth remain of any Diviſion, it is of the ſame Denomination as the Dividend was, as here in the laſt Example, 7225 Three-half-pence being divided by 8, there remains one Three-half-pence.

1/6 864 at 2 *d.* 1/4

1/8 144
18

16 | 2

82—2—0 *facit.*

1/6 3714 at 2 *d.* 1/2

1/4 619
154-9

77 | 3—9

38·13—9 *facit.*

1/6 417 at 2 *d.* 3/4

1/4 69—6
1/2 17—4—1/2
8—8—1/4

9|5-6—3/4

4·15 6—3/4 *facit.*

1/4 3716 at 3 *d.* 1/4

1/12 929
77—5

100|6—5

50-6—5 *facit.*

lb.

1/4 41712 at 3 *d.* 1/3

1/6 10428
1738

1216|6

608-6-0 *facit.*

1/4 817 at 3 *d.* 3/4

1/4 204—3 *d.*
51—0 3/4

25|5·3 3/4

12-15-3 3/4 *facit.*

7138

1/6 | 7138 at 4 d. 1/4

1/8 | 1189 — 8
1189 — 8
148 — 8 1/2

252|8—0 1/2

126-8—0 1/2 facit.

1/3 | 5171 at 4 d. 1/2

1/8 | 1723—8
215—5 1/2

193|9—1 1/2
96-19—1 1/2 facit.

1/3 | 971 at 4 d. 3/4

1/8 | 323—8
1/2 | 40—5—1/2
20—2—3/4

38|4—4—1/4

19-14-4 1/4 facit.

1/3 | 712 at 5 d.

1/4 | 237—4
59—4

29|6—8

14-16-8 facit.

1/2 | 3716 at 7 d.

1858
1/6 | 309—8

216|7-8

108-7-8 facit.

1/3 | 8716 at 8 d.

2905—4
2905—4

581|0—8

290-10-8 facit.

637

½	6371 at 9 *d.*
½	3185——6
	1592——9
	477 | 8—3
	238-18—3 *facit.*
½	846 at 10 *d.*
½	423
⅓	211—6
	70—6
	70 | 5—0
	35--5—0 *facit.*
½	4687 at 11 *d.*
⅓	2343——6
¼	1562——4
	390——7
	429 | 6—5
	214-16—5 *facit.*

	2716 at 12 *d.*
	271|6
	135 *l.* 16 *s. facit.*
½	3762 at 12 *d.* ¼
½	1881
	940——6
⅓	940——6
	78——4 ½
	384|0——4 ½
	192—0—4 ½ *facit.*

5627

5627 Ells, at 13 *d. per* Ell.

IV. As for the 12 *d.* that is done to your hand, there being ſo many Shillings as there are Ells: Then for the Peny, conſider that at 12 *d. per* Ell it comes to ſo much, and for the odd Peny take $\frac{1}{12}$ of the given Sum, which will make likewiſe Shillings. And thus you may do touching any of the following Queſtions, by taking the even or uneven Parts, as you have learned before.

2684 at 13 *d.*

$\frac{1}{12}$ 2684
223—7

290|7—7

l. *s.* *d.*
145—7—7 *facit.*

8642 at 14 *d.*

$\frac{1}{6}$ 8642
1440 —— 4

1008 | 2 —4

504—2—4 *facit.*

7684 at 15 *d.*

$\frac{1}{4}$ 7684
1921

960 | 5

480—5 *facit.*

3716 at 16 *d.*

$\frac{1}{3}$ 3716
1238—— 8 *d.*

495 | 4—8

247-14—8 *facit.*

3141 at 17 *d.*	417 at 21 *d.*
1236 at 18 *d.*	1021 at 22 *d.*
26812 at 19 *d.*	317 at 23 *d.*
1213 at 20 *d.*	1712 at 2 *s.*

V. Obſerve, that as many Yards as there are, ſo many two Shillings: Therefore multiply by 2, and the Product will be Shillings: And this Method you may obſerve in all others.

Or this, if you will:

For thoſe even Parts of a Pound that are moſt familiarly known, as Two Shillings, you may take the $\frac{1}{10}$, for Two Shillings and ſix Pence the $\frac{1}{8}$, for Three Shillings and four Pence the $\frac{1}{6}$, for Four Shillings the $\frac{1}{5}$, for Five Shillings the $\frac{1}{4}$, for Six Shillings and eight Pence the $\frac{1}{3}$, for Ten Shillings the $\frac{1}{2}$.

2722

lb.
1712 at 2 *s.* *per* lb.
2

342|4

171 *l.* 4 *s.* *facit.*

Ells.

$\frac{1}{12}$ 7260 at 2 *s.* 1 *d.*
2

$\frac{1}{2}$ 14520
605

1512|5

756—5 *s.* *facit.*

412 at 2 *s.* 3 *d.*

106 at 2 *s.* 4 *d.*

171 at 2 *s.* 5 *d.*

$\frac{1}{2}$ 3672 at 2 *s.* 2 *d.*
2

7344
612

795|6

397 *l.* 16 *s.* *facit.*

If Pence be required in the Question, the Parts for Pence take out of the given Sum, as in these three last Examples do appear.

1410 at 2 *s.* 6 *d.*

712 at 2 *s.* 7 *d.*

100 at 2 *s.* 8 *d.*

6101 at 2 *s.* 9 *d.*	6109 at 2 *s.* 11 *d.*
1006 at 2 *s.* 10 *d.*	

4672 Ells and $\frac{1}{2}$ at 4 *s.* and 4 *d. per* Ell.

Queſtions of this nature, that do conſiſt of ſeveral Denominations, as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, *&c.* are wrought as before, only for the half Ell, take half of the given Price of an Ell, *&c.* for a quarter, take a quarter of the Price, *&c.* and add it to the former Sum.

Example.

	Ells.					C.		s.	d.	
$\frac{1}{3}$	4672	$\frac{1}{2}$	at	4 *s.*	4 *d.*	$\frac{1}{2}$	17	$\frac{1}{4}$	at 17	7 *per C.*
	4			2	2		17			
	18688						119		4—4	$\frac{3}{4}$
	1557—4 *d.*						17			
	2—2					$\frac{1}{6}$	8—6			
	2024	7—6					1—5			
	1012	7—6 *facit.*					4—4	$\frac{3}{4}$		
							30	3—3	$\frac{3}{4}$	
							15	3—3	$\frac{3}{4}$	

VII. If the Price required be concerning Pounds neat, you must reduce the Hundreds gross into Pounds gross, and subtract the Pounds Tare from them, and the Remains will be Pounds neat.

	32 C. gross, Tare 172 lb. at 7 *d.* *per* lb. neat.	36 C. gross, Tare 94 lb. at 14 *d.* *per* lb. neat.
	32 112	36 112
	64 32 32	72 36 36
	3584 lb. gross. 172 lb. tare.	4032 lb. gross. 94 lb. tare.
	3412 lb. neat.	3938 lb. neat.
	lb. *d.*	lb. *d.*
½	3412 at 7 *per* lb.	3938 at 14 *per* lb.
½	1706 284—4 *d.*	½ 3938 656—4 *d.*
	199|0—4 *d.*	459|4—4 *d.*
	99-10—4 *facit.*	229-14-4 *facit.*

VIII. Again,

VIII. Again, Obſerve whether the Pounds Tare be abſolutely ſo much as in the laſt Example, or whether it be ſo much *per* Bag, *per* C. or Barrel, *&c.* If it be any of theſe, multiply the Tare given by the C. Bag, or Barrel, and the Product will be Pounds Tare, which ſubtract from the Pounds groſs, and the Remains are Pounds neat.

Example.

56 C. groſs, Tare 17 lb. *per* C. at 9 *d.* *per* lb. neat.

56	56
112	17
112	392
56	56
56	952

6272 lb. groſs.
952 lb. tare.
5320 lb. neat.

d.

½ 5320 lb. at 9 *per* lb.

½	2660
⅓	1330
	399|0

199-10 *facit.*

12 C. groſs, Tare 13 lb. *per* C. at 18 *d* *per* lb. neat.

12	12
112	13
24	36
12	12
12 lb. tare	156

1344 lb. groſs.
156 lb. tare.
1188 lb. neat.

d.

1188 at 18 *per* lb.

½	1188
⅓	594
	178|2

89-2-0 *facit.*

IX. Obſerve whether the given Price required be at ſo much *per* C. if ſo, then bring your Pounds Tare into C. and ſubtract them from the C. groſs.

Example.

17 C. groſs, Tare 11 lb. *per* C. at 15 *s. per* C. neat.

17
11

17
17

7 (5 C. *qrs.* lb.
x87 (1--2--19 *ta.*
xxx

C. *qr.* lb.
17—0— 0 *groſs.*
1—2—19 *tare.*

15—1— 9 *neat.*

C. *qr.* lb. *s.*
15—1—9 at 15 *per* C.
15

75
15

225
3—9
1--2 $\frac{1}{4}$

22 | 9—11 $\frac{1}{4}$

11—9—11 $\frac{1}{4}$ *facit.*

20 C. groſs, Tare 13 lb. *per* C. at 12 *s. per* C. neat.

20
13

60
20

260
(3 (6 C. *qr.* lb.
x8o (2—1—8 *ta.*
xxx

C. *qr.* lb.
20—0— 0 *groſs.*
2—1— 8 *tare.*

17—2—20 *neat.*

C *qr.* lb.
17—2—20 at 12 *s.*
12 (*per* C.

34
17

204
6
2—1 $\frac{1}{2}$

21 | 2—1 *d.* $\frac{1}{2}$

10-12—1 *d.* $\frac{1}{2}$ *fac.*

X. I

X. I think thoſe former Rules, well obſerved, to be ſufficient for your Inſtruction touching Tare; only if the groſs Hundreds have ſeveral Species, as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ odd Pounds, or the like, then conſider, if one C. give ſo much Tare, then a quarter of a C. will give a quarter ſo much; and if one quarter give ſo much, 14 Pound will give half ſo much; and if 14 Pound give ſo much, then 7 Pound will give half as much, *&c.*

Example.

13 C. $\frac{1}{2}$ groſs, Tare 12 lb. *per* C. at 2 *s.* 3 *d. per* lb. neat.	96 C. $\frac{1}{2}$ 14 lb. groſs, Tare 13 lb. *per* C. at 3 *s.* 6 *d. per* lb. neat.

What Tret is.

XI. Having thus ſhewed you the Way of finding out the Tare, I come in the next place to ſhew you how to find out the Tret, which is a certain Allowance of 4 lb. *per* 104 lb. upon many ſorts of Commodities.

Example.

39 C. groſs, Tare 15 lb. *per* C. and 4 lb *per* 104 lb. Tret, at 4 *s.* 6 *d. per* lb. neat.

1. Bring the C. groſs into Pounds groſs.

2. Multiply the ℔. Tare by the C. groſs, and the Product is the Pounds Tare.

3. Subtract the Pounds Tare from the Pounds groſs, and the Remain is ſubtil Pounds, which Pounds divide by 26, becauſe 26 is contained 4 times in 104, and as often as it is contain'd, ſo many Pounds Tret there are, which ſubtract from the ſubtil Pounds, and the Remain will be neat Pounds.

C.

39
112

78
39
39

4368 ℔. *groſs.*
585 ℔. *Tare.*

3783 ℔. *ſubtil.*
145 ℔. *Tret.*

3638 ℔. *neat.*

39
15

195
39
---
585 ℔. *Tare.*
(1
xx4 ℔.
378 (3 (145 *Tret.*
x666
xx

At 4 *s.* 6 *d. per* ℔. *facit* 821 *l.* 1 *s.*

Other

Other Ways there are to find out the Tare, but I conceive theſe are the moſt plain for young Learners: However, I ſhall give them one or two Examples of another manner of Working, which is both very commendable and ſpeedy.

1. When the Tare is 14 Pound *per Cent.* take the $\frac{1}{8}$ part of the Pounds groſs, and the Quotient will be Pounds Tare.

2. When the Allowance is Tare 16 *l. per Cent.* take the $\frac{1}{7}$ part, or divide it by 7, and the Quotient will be Pounds Tare.

3. Suppoſe it were Tare 24 *l. per Cent.* work firſt for 16, as before; then take the $\frac{1}{2}$ of that which 16 comes to, for if 16 produce ſo much, 8 muſt produce the $\frac{1}{2}$ of that, which being added, will make the Pounds Tare for 24 *l. per Cent.*

Again, Suppoſe it were at 20 *l. per Cent.* you may work firſt for 16, and then 4 will be the $\frac{1}{4}$ of that Quotient, which being added, maketh the Total of your Pounds Tare for 20 *l. per Cent.*

Again, Suppoſe it were for 12 *l. per Cent.* Tare, work as before for 16, which Quotient is for 4 too much; therefore take the $\frac{1}{4}$ of that, and ſubtract from that of 16, and the Remains will be Pounds Tare, or 12 *l. per Cent.*

Again, Suppose it were 7 Pounds *per cent.* Tare, work for 14, and if 14 comes to so much, then 7 will be $\frac{1}{2}$ of that. And you may with ease work all Questions of this kind, by making 14 or 16 your standing Rule, adding and subtracting the Part or Parts of it, more or less, as occasion requires. I might say more as to this, but shall forbear, only I will give you two or three Examples ready cast up, and state a few others to exercise your Ingenuity therewith.

48 C. gross, Tare 14 lb. *per cent.* at 10 *d.* $\frac{1}{2}$ *per* lb. neat.

C.
48
112

96
48
48

$\frac{1}{8}$ 5376 lb. *gross.*
672 lb. *tare.*

4704 lb. *neat.*

4704 lb. at 10 *d.* $\frac{1}{2}$ *per* lb.

56 C.

56 C. $\frac{1}{4}$ grofs, Tare 16 Pound *per Cent.* at 9 *d.* *per* Pound neat.

C.
56 $\frac{1}{4}$
4

391
28

1800
450

$\frac{1}{7}$ 6300 lb. grofs.
900 lb. tare.

d.
$\frac{1}{3}$ 5400 lb. neat at 9

$\frac{1}{3}$ 2700
1350

405|0

202·10—0 *facit.*

97 C. $\frac{3}{4}$ 11 lb. grofs, Tare 24 lb. *per Cent.* at 5 *d.* *per* lb. neat.

97 $\frac{3}{4}$ 11
4

391
28

3129
783

$\frac{1}{7}$ 10959 lb. grofs.

$\frac{1}{2}$ 1565
782

2347 lb. tare.

$\frac{1}{3}$ 8612 lb. neat 5 *d.*

$\frac{1}{4}$ 2870—8
717—8

358|8—4

179—8—4 *facit.*

19 C. $\frac{1}{4}$ 11 lb. groſs,
Tare 18 lb. *per cent.*
at 7 *d.* $\frac{1}{2}$ *per* lb. neat.

20 C. $\frac{1}{2}$ 13 lb. groſs,
Tare 12 lb. *per cent.*
at 10 *d. per* lb. neat.

34 C. $\frac{1}{4}$ 19 lb. groſs,
Tare 7 lb. *per cent.*
at 11 *d. per* lb. neat.

86 C. $\frac{1}{2}$ 13 lb. groſs,
Tare 13 lb. *per cent.*
at 8 *d. per* lb. neat.

13 C. $\frac{1}{2}$ groſs, Tare
22 lb *per cent.* at
16 *d. per* lb. neat.

19 C. $\frac{1}{4}$ 19 lb. groſs,
Tare 19 lb. *per cent.*
at 18 *d. per* lb. neat.

CHAP.

CHAP. XVI.

The Double Rule of Three.

HAving ſomewhat at large inſiſted upon the two laſt Rules, *viz. The Rule of Three* and *Practice*; I come to the ſecond Rule of Proportion, commonly called *The Double Rule of Three*, which hath its Denomination from its double working: and, as I did in the former *Rule of Three*, proceed with one plain and eaſie working of the ſame, either Direct or Indirect; ſo I ſhall here alſo obſerve the ſame Order. But here firſt a diligent heed muſt be had unto the ſtating of the Queſtion, becauſe under this Rule are comprehended divers Rules of *Plural Proportion*. Therefore obſerve, as in the former Rule of Three, ſo in this,

1. That firſt and third Numbers be both of one Species, *viz.* if the firſt Number be Principal, the third muſt be Principal; if the firſt be Intereſt, the third muſt be Intereſt.

If the firſt be Time, the third muſt be Time; if the firſt be Men, the third muſt be Men.

2. Of

2. Observe, that the two first Terms in the Question do consist of a Supposition, and the third Term of a Demand.

Example.

If 100 *l.* in 12 Months gain 6 *l.* what shall 276 *l.* gain in 18 Months?

1. Here you see the Supposition is,
   If 100 *l.* gain 6 *l.*
2. The Demand is,
   What will 276 *l.* gain?

100 *l.* —— 6 *l.* —— 276 *l.*?

20	1440
120	11040
12	1104
1440	276
	3974|40

Cut off the two first Figures, and the rest are Pence, *viz.* 39 7 4 *d.*

Then say,

If 12 *Men* —— 3974 *d.* —— what 18 *Men*?

Facit 5961 *d.*

If 6 Clerks can write 45 Sheets of Paper in 5 Days, how many Clerks can write 300 Sheets in 13 Days after that proportion?

Sheets.

Sheets.	Clerks.	Sheets.
45	6	300
		6
		1800

40 Clerks.

Days.	Clerks.	Days.
5	40	13 *
	5	
	200	

7 (5 Clerks.
200 (15 $\frac{5}{13}$ *facit.*

* *Observe here, and so in others, whether the Demand be more or less, and work as hath been taught.*

If the Carriage of 56 C. weight 100 Miles cost 14 *l.* what will 13 C. cost being carried 29 Miles, after that Rate?

C.	*l.*	C.
56	14	13
		14
		52
		13
		182

1 (4
182 (3 *l.* 5 *s.*

If 100 Miles——3 *l.* 5 *s.*——29 Miles?

20 65

65 145

174

18|85

Facit 18 *s.* $\frac{17}{20}$.

If 8 Taylors make 4 Sutes of Clothes in 10 Days, how many will make 15 Sutes in 14 Days?

If 4 Sutes——8 Taylors——15 Sutes?

8

xxø (30 *facit.* 120

44

If 10 Days——30 Taylors——14 Days?

30

300

x (6

3øø (21 $\frac{3}{7}$

x44

x

Of what Principal was 150 *l.* gained in 19 Months, when 100 *l.* in 12 Months gained 6 *l*?

Facit 1578 *l.* $\frac{18}{19}$ *Principal.*

How

How long time was 900 *l.* a gaining 420 *l.* when 6 *l.* was gained of 100 *l.* in 12 Months?

Facit 93 *Months* $\frac{1}{3}$

A Scrivener lent 700 *l.* at Intereſt the 22 of *October* 1639, and upon the 9th of *December* 1645, received for the Intereſt thereof 330 *l.* I demand at what Price *per Cent. per Annum* it was lent?

The time is 6 *years* 1 *mo.* 17 *d. Facit* 7 *l.* $\frac{10837}{15859}$

If I ſow 20 Buſhels of Peaſe, and they produce in one Year 276 Buſhels; I demand how many Buſhels in 6 Years will 90 Buſhels produce after that proportion?

Facit 7452 *Buſhels.*

What is the Principal that gained 476 *l.* in 16 Months, when 100 *l.* in 12 Months gained 6 *l?*

5950 *l. Principal.*

In what time was 850 *l.* gained of 940 *l.* when 100 *l.* in 12 Months gains 6 *l?*

Facit 15 *years* 25 *days* $\frac{25}{47}$

If 100 *l.* in 12 Months gained 6 *l.* what Money was that which gain'd me in 8 Mon. 10 *l?*

Facit 250 *l. Principal.*

If

If 4 *s.* 8 *d.* pay 1 Soldier for 1 Week, how many Dollars at 4 *s.* 2 *d.* will pay 80 Men for 1 Month?

Facit 358 *Dollars* $\frac{2}{5}$

An Usurer lent the 11 of *July* 1647 a Sum of Money at Interest for 6 *l. per Cent.* and on the 27 of *February* 1651 received for Interest thereof 318 *l.* 12 *s.* I demand what was the Sum lent?

The time between the 11th. of July 47, *to the 27th. of* February 51; *is* 4 *Years* 7 *Months* 16 *Days.*

Facit 1148 *l.* $\frac{326}{1088}$.

If 10 Bricklayers make a Wall of 100 Foot long, and 20 Foot high, in 12 Days, how many Bricklayers will make a Wall of 236 Foot long, and 20 Foot high, in 16 Days?

Facit 17 *Men* $\frac{7}{10}$.

CHAP.

CHAP. XVII.

A most brief and compendious Way of Working all manner of Questions upon Interest.

Example.

FIrst, State your Question thus:

If 100 *l.* gain 6 *l.* what the Principal?

2. Multiply the second and third Numbers together, and divide by your first, which is done by cutting off the two first Figures of the Pounds with a Line.

3. Multiply them by 20, by 12, and 4, and all above two Figures in each Multiplication carry over the Line to the left, as you see in these following Examples.

If 100 *l.* in 12 Months gain 6 *l.* what will 356 *l.* gain in 18 Months?

If 100 *l.* ——— 6 *l.* ——— 356 *l.*?

	l.	*s.*	*d.*
12 *Mon. fa.*	21	07	2 ¼
6 *Mon. fa.*	10	13	7
	32	00	9 ¼

6

21 | 36
20

7 | 20
12

2 | 40
4

1 | 60

275 *l.*

275 *l.* let out for three Years, at 6 *l. per Cent. per Annum.*

100 — 6 — 275
6

	l.	*s.*	*d.*	16 | 50
1 Year *facit*	16	10	0	Then | 20
				3
3 Years will be 3 times this Sum				10 | 00

236 *l.* 10 *s.* 5 *d.* let out for 16 Months, at 6 *l. per Cent. per Annum.*

100 *l.* — 6 — 236 — 10 — 5
6

	mo.	*l.*	*s.*	*d.*	14 | 19 — 02 — 6
Facit in	12 :	14	3	$9\frac{3}{4}$	| 20
	$\frac{1}{3}$	4	14	$7\frac{1}{4}$	
					3 | 82
	mo.				| 12
Facit in	16 :	18	18	4	
					9 | 90
					| 4
					3 | 60

The

The ſame Order obſerve for Intereſt upon Intereſt; only add the laſt Intereſt to the third Number of the laſt Queſtion, and work as before in theſe Examples following.

417 *l.* 11 *s.* 8 *d.* let out for four Years, at 6 *l. per Cent. per Annum*, Intereſt upon Intereſt.

l.	*l.*	*l.*	*s.*	*d.*
100	6	417	11	8
				6
		25	05	10 — 0
			20	
		1	10	
			12	
		1	20	
			4	
			80	

Facit 25 *l.* 1 *s.* 1 *d.*

Multiply ſecond and third Numbers together, ſaying, 6 times 8 Pence is 48 Pence, which is 4 Shillings, ſet down 0 and carry 4 to the Shillings, ſaying, 6 times 11 is 66, and 4 that I carried is 70 Shillings; ſet down the 10 *s.* and carry 3 to the Pounds, ſaying, 6 times 7 is 42, and 3 that I carried is 45, ſet down

down 5 and carry 4, ſaying, 6 times 1 is 6, and 4 that I carried is 10, ſet down 0 and carry 1, ſaying, 6 times 4 is 24, and 1 that I carried is 25, which ſet down, and cut off the two firſt Figures of the Pounds, and multiply as before, and the Product will be according to the Examples, 25 *l.* 1 *s.* 1 *d.* ſimple Intereſt for the firſt Year, the which add to your former Principal 417 *l.* 11 *s.* 8 *d.* and it will make 442 *l.* 12 *s.* 9 *d.* Then ſtate your Queſtion again, ſaying,

	l.	*s.*	*d.*
If 100 *l.* —— 6 *l.* ——	442	12	9
			6

				26	55—16—6
					20
	l.	*s.*	*d.*	*q.*	11 16
Second Year	26	11	1	3	12
					1 98
					4
					3 92

	l.	*s.*	*d.*
Add this Intereſt unto the	442	12	09
and it will make ——	469	03	10

The

Then ſtate your Queſtion again, and work as before, ſaying,

	l.	*s.*	*d.*
100 *l.* —— 6 *l.* ——	469	3	10 ¾
			6

	l.	*s.*	*d.*
Third Year	28	3	0 ¼

28 | 15—3—4 ½
20

Which 28 *l.* 3 *s.* 0 *d.* ¼ add unto the 469 *l.* 3 *s.* 10 *d.* ¾, *facit* 497 *l.* 6 *s.* 11 *d.* Then ſtate your Queſtion again, and work as before, ſaying,

3 | 03
12

0 | 40
4

1 | 62

	l.	*s.*	*d.*
100 *l.* —— 6 *l.* ——	497	6	11
			6

29 | 84—1—6
20

Which being added to the 497 *l.* 6 *s.* 11 *d.* *facit* 527 *l.* 3 *s.* 8 *d.* ¾ Intereſt upon Intereſt for 4 Years, at 6 *l.* *per Cent.* *per Annum.*

16 | 81
12

9 | 78
4

3 | 12

And

And thus you may in a brief manner work all Queſtions of this nature. Other Ways of Working there are, of which I ſhall give you two or three Examples, and leave them to your Conſideration.

Example:

I demand how much the Intereſt of 819 *l.* will amount unto for 3 Years 7 Months 18 Days, after 6 *l. per Cent. per Annum* Intereſt upon Intereſt?

If

If 100 —— 106 —— 819
20

16380
12

196560
106

1179360
1965600

208353 (60 *first Year.*
106

1250118
2083530

220854 (18 *second Year.*
106

1325124
2208540

234105 (24 *third Year.*
106

1404630
2341050

248151 (30 *fourth Year, from which subtract the third.*
234105

14046 *one Year.*

7023 : 6 *months.*
1170 : 1 *month.*
585 : 15 *days.*
117 : 3 *days.*
234105 : *third Year.*

Facit 243000 *d.*

A Table

A Table to find out what any Sum of Money will amount to for 21 *Years, or under, at* 6 l. *in the Hundred, Intereſt upon Intereſt.*

	l.	*s.*	*d.*	*q.*
1	1	01	02	1
2	1	02	05	2
3	1	03	09	3
4	1	05	03	0
5	1	06	09	0
6	1	08	04	1
7	1	10	00	3
8	1	11	01	2
9	1	13	09	1
10	1	15	09	3
11	1	17	11	2
12	2	00	02	3
13	2	02	07	3
14	2	05	02	2
15	2	07	11	0
16	2	10	09	2
17	2	13	10	0
18	2	17	00	3
19	3	00	05	3
20	3	04	01	2
21	3	07	11	2

The Table is ſo plain, that I ſuppoſe it needs very little Demonſtration; I ſhall therefore only give you one or two Examples.

As,

If you would know what 36 *l.* comes to Intereſt upon Intereſt for 20 Years.

Look againſt Number 20 in the firſt Column, and you will find what the Intereſt upon Intereſt of 1 *l.* comes to for that time. Then ſay, by the Rule of Three,

If 1 *l.*——3 *l.* 4 *s.* 1 *d.* 2 *q.*——36 *l.*?

If

I deſire to know how much 346 Pound will amount unto in 13 Years, Intereſt upon Intereſt, at 6 Pounds *per Cent.*

Look againſt Number 13 in the firſt Column, and you will find 2 *l.* 2 *s.* 7 *d.* 3 *q.*

Then ſay as before,

	l.	*s.*	*d.*	*q.*	
If 1 be	2	2	7	3	346 *l.*

20

42
12

511
4

2047 *qr.*

346

12282
8188
6141

708262

xx x(2 708262 444444

5966 (x7706 (5(1475|5 xxxxxx xxxx

737—15—5 ½ *fac.*

A very brief and neceſſary Table to find out the preſent Worth of the Annuity *or yearly Rent for* 21 *Years, or under, after the Rate of Six Pound* per Cent. per Annum.

	l.	*s.*	*d.*	*q.*
1	0	18	10	2
2	1	16	08	0
3	2	13	05	2
4	3	09	03	2
5	4	04	02	3
6	4	18	04	0
7	5	11	07	3
8	6	04	02	2
9	6	16	00	2
10	7	07	02	2
11	7	17	09	0
12	8	07	08	0
13	8	17	00	2
14	9	05	11	0
15	9	14	02	3
16	10	02	01	1
17	10	09	06	2
18	10	16	06	1
19	11	03	01	3
20	11	09	04	3
21	11	15	03	1

For the underſtanding of this Table, the ſame Order is to be obſerved with the former: As for Example.

If you would know what one Pound yearly Rent is worth for 7 Years in ready Money,

Look againſt Number 7 in the firſt Column, and you will find what 1 Pound is worth for ſeven Years, *viz.* 5 —— 11 —— 7 $\frac{3}{4}$.

Now to know what any other *Annuity* (as 40 *l. &c.*) is worth for the ſame time, ſay by the Rule of Three,

If

l. *s.* *d.* *q.*
If 1 *l.* be—5—11—7—3 what 40 *l.*?
l. *s.* *d.*
Facit 223—5—10

I have a Shop, a Place, or an Office, *&c.* worth 60 *l.* *per Annum* for 21 Years, and would ſell it for ready Money; the Queſtion is, how much it is worth?

Look againſt Number 21, and you will find 1 *l.* a Year is worth for that time 11 *l.* 15 *s.* 3 *d.* 1 *q.* Then ſay,

If 1 *l.* be worth 11 *l.* 15 *s.* 3 *d.* $\frac{1}{4}$, what ſhall 60 *l.* be?

Facit 705 *l.* 16 *s.* 3 *d.*

What is 10 *l.* *per Annum* worth in ready Money for 4 Years and $\frac{1}{2}$ to come, at 6 *l.* *per Cent*?

Facit 38 *l.* 7 *s.* 7 *d.* $\frac{1}{4}$

Firſt ſee the Table what 1 *l.* is worth for 4 Years.

Facit 3 *l.* 9 *s.* 3 *d.* $\frac{1}{2}$

Then ſay, If 1 *l.* be worth 3 *l.* 9 *s.* 3 *d.* $\frac{1}{2}$, what ſhall 10 *l.*? *Facit* 34 *l.* 12 *s.* 11 *d.*

Now to find what the ½ Year is worth, ſee in the Table what 1 *l.* is worth for 5 Years. *Facit* 4 *l.* 4 *s.* 2 *d.* ¾

Then ſay, If 1 be—4 *l.* 4 *s.* 2 *d.* 3 *q.*—10?

From which ſubtract the 4th Year,	5 *Years.*	42 *l.* 2 *s.* 3 *d.* ½
and the Remains will be for 1 Year;	4 *Years.*	34 *l.* 12 *s.* 11 *d.*
then take the ½ of it, which will ſhew what the ½ Year is worth.	1 *Year.*	7 *l.* 9 *s.* 4 *d.* ½
	½ *Year.*	3 *l.* 14 *s.* 8 *d.* ¼

Facit 3 *l.* 14 *s.* 8 *d.* ¼

Which added to the *Facit* of the fourth Year, and it maketh 38 *l.* 7 *s.* 7 *d.* ¼.

CHAP. XVIII.

The Rule of Fellowſhip without Time.

1. IN the working of this Rule there is no difference betwixt it and the Rule of Three, where every Man's particular Stock being added together, the Total muſt be the firſt Number in the Rule of Three, the Gains the ſecond, and every Man's particular Stock the third.

The

The Uſe of this Rule is therefore to give to each Partner his juſt and equal Share.

Obſerve then,

I. *As the whole Stock is to the whole Gain, ſo is every Man's particular Stock to every Man's particular Gain.*

Example.

Two Merchants Company: *A* put in 20 *l.* *B* put in 40 *l.* and they gained 50 *l.* I demand each Man's Part of the Gains?

A —— 20 *l.*
B —— 40 *l.*

If 60 *l.* gain 50 *l.* what ſhall 20 *l.*?
Facit 16 *l.* 13 *s.* 4 *d.* *A.*

If 60 *l.* gain 50 *l.* what will 40 *l.*?
Facit 33 *l.* 6 *s.* 8 *d.* *B.*

50 — 0 — 0

If both the Shares added together make up the whole Gains, then is the Work right.

Three Farmers hired a Shepherd to keep their Sheep for 7 *l.* 10 *s. per annum.*

The firſt committed 430 Sheep to his care, the ſecond 357, and the third 500 Sheep: I demand how much each Man muſt pay of this 7 *l.* 10 *s.*

	l.	*s.*	*d.*	
A muſt pay	2	10	1	$\frac{513}{1287}$
B muſt pay	2	01	7	$\frac{387}{1287}$
C muſt pay	2	18	3	$\frac{387}{1287}$
Proof	7	10	0	

Four Merchants ventur'd to Sea a Stock of 2475 *l.* whereof *A* put in 710 *l.* *B* put in 960 *l.* *C* put in 207 *l.* *D* put in 598 *l.* and they gained 2000 *l.* But Tempeſtuouſneſs of Weather ariſing, were forced to caſt overboard as many Goods as amounted to 769 *l.* I demand what each Man muſt bear of this Loſs?

	l.	
A muſt bear	220	$\frac{1490}{2475}$
B ———	298	$\frac{690}{2475}$
C ———	64	$\frac{783}{2475}$
D ———	185	$\frac{1987}{2475}$
Facit	769	

Four

Four Grocers laid in a Stock containing these several Sums following: *A* put in 120 *l.* *B* put in 136 *l.* *C* put in 180 *l.* *D* put in 210 *l.* and with it they bought a Parcel of Fruit, by which they gained 398 *l.* I demand each Man's Part of the Gains?

		l.	
Answer	*A*	73 $\frac{602}{646}$	602
	B	83 $\frac{510}{646}$	510
	C	110 $\frac{580}{646}$	580
	D	129 $\frac{246}{646}$	246
		398	1938 (3
			646

Three Merchants made a Company, *A* put in a certain Sum of Money, *B* put in as oftentimes 5 *l.* as *A* put in 4 *l.* *C* put in as oftentimes 7 *l.* as *B* put in 6 *l.* and they have gained together a certain Sum of Money, whereof *A*'s Part is 100 *l.* I demand *B* and *C*'s Part, and whole Gains?

4 —— 100 —— 5 *facit* 125 *B.*
6 —— 125 —— 7 *facit* 145 $\frac{5}{6}$ *C.*
facit 100 *A.*

370 $\frac{5}{6}$

Two Merchants made a Company: *A* put in 350 *l.* and they gained together 196 *l.* of which *B* muſt have ſo oftentimes 10 *l.* as *A* muſt have 6 *l.* I demand how much Money *B* put in the Company?

Always obſerve, that every Man muſt have according as he hath put in: Then conſider,

If 6 ——— 350 ——— 10?

Facit 583 *l.* $\frac{1}{3}$ *B put in.*

Two Men Company and make a Stock of 700 *l.* whereof *A* put in 300 *l.* and they have gained together 240 *l.* I demand what each Man muſt have of the Gains?

Facit 102—17—01 $\frac{5}{7}$ *A.*
Facit 137—02—10 $\frac{2}{7}$ *B.*

240—00—00

Three Merchants made a Company: *A* put in 600 *l.* *B* put in ſo oftentimes 50 *s.* as *A* put in 40 *s.* *C* put in ſo oftentimes 70 *s.* as *B* put in 60 *s.* and they gained together

together 500 *l.* I demand what each Man put in, and muſt have of the Gains?

In Queſtions of this nature, the particular Stocks unmentioned muſt be found out by that which is mentioned.

As for Example: To find what Stock *B* put in;

l.

If — 4 — 600 — 5?

Facit 750 *l. B.*

Such Relation as 6 has to the Money which *B* put in, ſuch Relation muſt 7 have to the Money which *C* put in: As,

l.

If — 6 — 750 — 7?

Facit 875 *l. C.*

600 — *A.*
750 — *B.*
875 — *C.*

2225

l.

1 { 2225 — 500 — 600 *A.*
2 { 2225 — 500 — 750 *B.*
3 { 2225 — 500 — 875 *C.*

2225

Three Merchants made a Company, *D* put in 437 *l.* *E* put in 211 *l.* and they have gained together 562 *l.* whereof *F* muſt have 187 *l.* 15 *s.* I demand *D* and *E*'s Part, and what *F* put into Company?

To find what *F* put in, firſt ſubtract his particular from the whole Gain.

l.	*s.*
562	00
187	15
374	05

Then add *D* and *E*'s Stock together.

437 *D.*
211 *E.*
648

Gain.	*Stock.*	*Gain.*
374 *l.* 5 *s.*	648	187 *l.* 15 *s.*

Facit 325 *l.* $\frac{615}{7485}$

Then to find *D* and *E*'s Part of the Profit:

Stock.	*l.*	*s.*	*Stock.*	
648	374	5	437	*D.*
648	374	5	211	*E.*

Fellowſhip

Fellowship with Time.

III. The Use of this Part is the same with the former, and differeth not in Operation, save in this, that every Man's Stock is multiplied by his Time, and the Total of those Products added together is the first Number, the Gain or Loss the second Number, and every Man's particular Stock and Time the third.

Observe then,

IV. *As the whole Stock and Time is to the whole Loss or Gain:*

So is every Man's particular Stock and Time to every Man's particular Loss or Gain.

Example.

Two Merchants Company, *D* put in 100 *l.* for four Months: *E* put in 136 *l.* for three Months: and they gained 50 *l.* I demand each Man's Part of the Gain?

	l.	*Mo.*	
D put in	100	4	400
E put in	136	3	408
			808

808

				l.
808	50 *l.*	400	*facit*	24 $\frac{608}{808}$
808	50 *l.*	408	*facit*	25 $\frac{200}{808}$
				50

Three Butchers hired a Piece of Ground for 12 *l.* 10 *s.* 6 *d.* *A* put in 20 Oxen 5 Days, *B* put in 16 Oxen 7 Days, *C* put in 25 Oxen 4 Days: I demand how much each Butcher ought to pay for his Proportion?

		Ox.	*Days.*	
A	put in	20	5	100
B	put in	16	7	112
C	put in	25	4	100
				312

l.	*s.*	*d.*		
312	12	10	6	100
Facit	4	0	3	$1\frac{6}{13}$
312	12	10	6	112
Facit	4	9	11	$\frac{1}{13}$
312	11	10	6	100
Facit	4	0	3	$\frac{9}{13}$

A

	l.	*s.*	*d.*
A	4	0	$3\frac{6}{13}$
B	4	9	$11\frac{1}{13}$
C	4	0	$3\frac{6}{13}$
Proof	12	10	6

$13 \overline{)1}$

13

Three Merchants Company: *A* put in the first of *January* 120 *l.* until *March* the 22. *B* put in 176 *l.* the 10 of *February* until the 12 of *April.* *C* put in 295 *l.* the 2 of *February* until the 25 of *April*; and they gained 800 *l.* I demand each Man's Part of the Gains?

	l.
A must have	$174\frac{75}{446}\frac{96}{446}$
B must have	$192\frac{16}{446}\frac{76}{446}\frac{8}{446}$
C must have	$433\frac{202}{446}\frac{82}{446}$
Proof	800

$446 \overline{)446}$

446

Three

Three Merchants Company for 18 Months, *D* put in 500 *l.* and at 5 Months took out 200 *l.* and at 10 Months put in more 300 *l.* and at 14 Months took out 130 *l.* *E* put in 400 *l.* and at 3 Months put in more 270 *l.* and at 9 Months took out 140 *l.* and at 12 Months put in more 100 *l.* and at 15 Months took out 99 *l.* *F* put in 900 *l.* and at 6 Mo. took out 200 *l.* and at 11 Months put in 500 *l.* at 13 Months took out 600 *l.* and they gained 200 *l.* I demand each Man's Part of the Gains?

l.

D muſt have 50 $\frac{12350}{32873}$
E muſt have 62 $\frac{20474}{32873}$
F muſt have 87 $\frac{49}{32873}$

Proof. 200

32873 (1
32873

Two Men made a Stock of 165 *l.* wherewith they gained 28 *l.* which added to the Stock makes 193 *l.* *D*'s Money was in 12 Months, and *E*'s Money was in but 8 Months. When they ſhared the Stock and Gain, *D* had 67 *l.* and *E* 126 *l.* I demand what was each Man's Stock?

State

State your Queſtion thus:

As 12 *mo.* to 165 *l.* ſo is 8 *mo.* to 110 *l.* for *E*'s Stock; the which ſubtract from 165, and the Remainder will be 55 *l.* for *D*'s Stock.

The Proof.

If 55 *l.* in 12 *mo.* gain 12 *l.* what 110 *l.* in 8 *months?* *Gains.*

55 *l.* —— 12 *l.* —— 110 *l.* *Facit* E 16 *l.*

mo. 12. 8 *mo.* *Facit* D 12 *l.*

Or,

Having the Stock, you have the Gains by ſubtracting each Man's Stock from his Stock and Gain given, without the Rule of Three.

Stock and Gain of *D*—67 *l.*
Stock of *D* ——— 55

D his Gain—— 12

Stock and Gain of *E*—126
Stock of *E* ——— 110

E his Gain—— 16

So that *D* with 55 *l.* Stock gains 12 *l.* *E* with 110 *l.* gains 16 *l.*

12

28

CHAP.

CHAP. XIX.

Of Barter.

BArter is the exchanging Wares for Wares, or one Commodity for another.

Example.

Two Merchants barter: *A* hath 3 C. $\frac{1}{2}$ of Pepper at 13 *d.* $\frac{1}{2}$ *per* Pound; *B* hath Ginger at 15 *d.* $\frac{1}{4}$ *per* Pound. I demand how much Ginger must be delivered for the Pepper?

1. See what the Pepper is worth, saying, If 1 *l.* cost 13 *d.* $\frac{1}{2}$, what cost 3 C. $\frac{1}{2}$?

Facit 22 *l.* 1 *s.*

2. Say, If 15 *d.* $\frac{1}{4}$ buy 1 ℔ of Ginger, what will 22 *l.* 1 *s.* buy?

Facit 347 $\frac{1}{61}$ *Ginger.*

Two Men Barter: *A* hath 20 Ells of Cloth at 9 *s.* 6 *d. per* Ell ready Money, but in Barter he will have 10 *s.* 2 *d. per* Ell: *B* hath *Jersey* Wooll at 2 *s.* 10 *d. per* Pound. I demand how much Wooll must be delivered for the Cloth in Barter?

As

As before, ſo here:

If 1 Ell in Barter be 10 *s.* 2 *d.* what 20 Ells in Barter?

Facit 2440 *d.*

If 34 *d.* buy 1 ℔. what will 2440 *d.* buy?

Facit 71 *l.* $\frac{3}{17}$

Two Drapers Barter, the one hath 472 Yards of Canvas at 16 *d. per* Yard, the other lets him have 38 Pieces of Cloth: The Queſtion is, how much one Cloth ſtands him in?

Facit 16 *s.* $\frac{1}{2}$

20 Bags of Hops, each 3 C. $\frac{1}{2}$, bartered for 336 C. of Brazil, at 18 *s.* a C. I demand what Price were the Hops ſold at?

Anſwer 4 *l.* 6 *s.* $\frac{14}{35}$ *per* C.

A Merchant hath Tabacco, which he will barter at 14 *d. per l.* for Sugar at 10 *d. per* Pound in Barter: I demand how much Tabacco muſt be given for 8900 ℔. of Sugar?

Anſwer 6357 ℔. $\frac{1}{7}$

Nutmegs

Nutmegs at 4 *s.* 2 *d. per* ℔ ready Money, 5 *s.* in Barter, how muſt Pepper at 12 *d. per* ℔. be ſold to make the like Profit?

Anſwer 14 *d.* $\frac{4}{5}$

How many Dozen of Candles at 5 *s.* 2 *d. per* Dozen muſt be given for 3 C. 2 Qrs. 16 ℔ of Tallow at 37 *s.* 4 *d. per* C?

Anſwer 26 *Dozen* $\frac{2}{31}$

A Merchant hath Stockings at 39 *s. per* Dozen ready Money, which he will barter at 46 *s. per* Dozen for Canvas, at 13 *d.* $\frac{1}{2}$ *per* Ell ready Money. I demand what Price the Canvas muſt bear in Barter to gain 5 *l.* in the 100 *l?*

Anſwer 16 *d.* $\frac{1}{2}$ *and* $\frac{57}{130}$ *of* $\frac{1}{2}$ *d.*

Broad-Cloth of 6 *s.* 8 *d.* the Yard ready Money, is bartered for 7 *s.* 9 *d.* for Wooll at 10 *d. per* ℔. ready Money. What Price muſt be made of the Wooll in Barter, to gain 11 *l. per Cent?*

Anſwer 12 *d.* $\frac{724}{800}$

D hath Holland of 5 *s. per* Ell ready Money, bartered at 6 *s. per* Ell to *E*, for Broad-Cloth at 9 *s.* 6 *d. per* Yard, which coſt

but

but 8 *s.* I demand which gaineth moſt, and how much *per Cent* ?

Anſwer. *D* gains 20 *l. per Cent.*
E 18 *l.* 15 *s. per Cent.*

CHAP. XX.

Of Equation.

THE Rule of Equation of Payments teacheth to reduce the Times of ſeveral particular Payments to one Time for the Payment of the whole Sum.

Example.

If the Queſtion be of this Nature,

A Merchant oweth 500 *l.* to be paid at 3 Payments, *viz.* 300 *l.* at 4 Months, 100 *l.* at 6 Months, and 100 *l.* at 12 Months. The Debtor agrees to diſcharge the whole Debt at one Payment. Now the Queſtion is, at what

what time the Payment ought to be made, without Damage unto the Debtor or Creditor, accounting 6 *l. per Centum per Annum* Intereſt.

The Rule is thus.

II. Multiply each particular Payment by its Time; then add all the Products together, and divide the Total by the whole Debt.

l.		*Mo.*	
300	multiplied by	4	*facit* 1200
100	multiplied by	6	*facit* 0600
100	multiplied by	12	*facit* 1200

Diviſor 500 *Dividend* 3000

3000 (6
500

So that the Anſwer to the Queſtion (according to this Rule) is, that ſix Months is the Time for the Payment of the whole Sum.

III. *For*

III. *For the Proof of this Rule, thus:*

300 *l.* ought to be paid at 4 Months, and is not paid till 6 Months, that is 2 Months after its time. The Intereſt of 300 *l.* for 2 Months is 3 *l.*

Then 100 *l.* paid at 6 Months is the time equared.

The other 100 *l.* to be paid at 12 Months, is paid 6 Months before its time; and the Intereſt thereof for 6 Months is likewiſe 3 *l.*

Which ſheweth the Rule to be true, and that 6 Months is the time for the Payment of the whole Sum; and thereby neither the Debtor nor Creditor is damaged according to the Law.

A Merchant oweth 450 *l.* to be paid at 3 Payments, $\frac{1}{3}$ at 3 Months, $\frac{1}{3}$ at 5 Months, and $\frac{1}{3}$ at 8 Months; and the Debtor and Creditor agree, that the whole Sum ſhall be paid at one time: The Queſtion is, What time ought the whole Sum to be paid in, ſo that neither the one nor the other may be damnified.

The

The Rule is to multiply each Part by its Time, thus:

3

$\frac{1}{3}$ by $\frac{3}{1}$ *facit* 1 *Mon.*

3

5

$\frac{1}{3}$ by $\frac{5}{1}$ *facit* 1 *Mo.* $\frac{2}{3}$

3

8

$\frac{1}{3}$ by $\frac{8}{1}$ *facit* 2 *Mo.* $\frac{2}{3}$

3

Facit 5 *Mo.* $\frac{1}{3}$

A Merchant oweth 300 *l.* to be paid $\frac{1}{3}$ a
3 Months, $\frac{1}{3}$ at 6 Months, and $\frac{1}{3}$ at 12 Mo
I demand at what time the ſaid Sum ough
to be paid all together.

3 Months.

$\frac{1}{3}$ by $\frac{3}{1}$ *facit* 1.

3
6

$\frac{1}{3}$ by $\frac{6}{1}$ *facit* 2.

3
12

$\frac{1}{3}$ by $\frac{12}{1}$ *facit* 4.

3

facit 7 *Mo.*

To prove the Certainty of this manner of Operation, you may take the ſame courſe as before, 7 Months being the Time for the Payment of the whole Sum.

See firſt what the Intereſt of the Money comes to, that ſhould have been paid before the 7 Months; and then ſee what the Intereſt of the Money comes to, that ſhould have been paid after the 7 Months: And if the Intereſt of the one Part be equal with the Intereſt of the other, then is the former Operation right, and 7 Months muſt needs be the juſt Time. As for Example.

100 *l.* ſhould have been paid at 3 Months, but now is not paid till 7 Months; ſo that

that the Intereſt for that 100 *l.* muſt be accounted for the 4 Months delay, which Intereſt is ——— 2 *l.*——00 *s.*

100 *l.* more ſhould have been paid at 6 Months, and now is delayed till 7 Months. The Intereſt for that is——— 0 *l.*——10 *s.*

Facit 2 *l.*——10 *s.*

The other 100 *l.* is paid 5 Months before its time, and the Intereſt thereof for 5 Months is likewiſe ——— 2 *l.*——10 *s.* equal with the former, which ſhews the Operation to be right.

There is owing to a Merchant 340 *l.* to be paid 80 *l.* ready Money, 100 *l.* at 3 Months, and 160 *l.* at 8 Months. I demand what is the indifferent time for the payment of the whole?

IV. In Queſtions of this nature, ſet down the particular Sums, and the ſeveral Times of payment, thus:

l.	*mo.*
80	00
100	03
160	08

Then multiply each Sum by its Time of Payment, and the Work will ſtand thus

Ad

Add all the Products together, and divide the Total by the whole Debt,

l.		*Mo.*	
8	0——0——	00	0
10	0——0——	30	0
16	0——0——	128	0

34 *Diviſor.* 158 *Dividend.*

(2(2

~~158~~ (4 $\frac{11}{17}$ *facit.*

~~34~~

There is 245 *l.* 10 *s.* 9 *d.* to be paid $\frac{1}{2}$ at 6 Months, $\frac{1}{3}$ at 8 Months, and the reſt at 12 Months. What is the indifferent Time for the payment of the whole Sum together?

This Rule is laid down in the firſt and ſecond Examples. Multiply each Part by its Time.

}	by	6	*facit* 3	The Certainty hereof is demonſtrated by the Proof of the third Example.
}		8	2 $\frac{2}{3}$	
}		12	2	

Facit Mo. 7 $\frac{2}{3}$

A is indebted unto *B* 300 *l.* to be paid 100 *l.* at 4 Months, and 200 at 8 Month.

And *B* oweth unto *A* 500 *l.* to be paid at 10 Months. It is agreed between them, *A* ſhall make preſent Pay of his whole Debt, and *B* ſhall pay his ſo much the ſooner as ſhall countervail that Favour: I demand at what time *B* muſt pay the 500 *l.* reckoning ſimple Intereſt?

V. For the Reſolution of this and the like Queſtions, firſt ſee by the former Rule what time *A* ought to pay in his whole Money.

Mo.

1 | 00 } at { 4 —— 4
2 | 00 } { 8 —— 16

(2
20 (6 $\frac{2}{3}$
3

Then ſay by the Rule of Three,

If 3 —— 6 $\frac{2}{3}$ —— 5
20 (4 *Mo. facit.*
5

Which 4 Months is to be ſubtracted from 10 Months, (the Time that *B* ought to have paid in his Money) and there remaineth 6 Months.

Obſerve,

Observe, For the Proof hereof, see first, what the Interest of 300 *l.* comes to for 6 Months $\frac{2}{3}$.

Then see what the Interest of 500 *l.* comes to for 4 Months. If both the Sums be alike, then is the former Work true.

A Merchant hath a certain Sum of Money owing to him, to be paid at 7 Months; his Debtor doth agree to pay him $\frac{1}{2}$ ready Money, and $\frac{1}{3}$ at 4 Months: I demand what time he must have to pay in the rest, so that neither Party may have advantage of the other, without reckoning Interest upon Interest?

VI. For the Resolution whereof, it matters not what the Sum was; but you may work the same by any Number that will easily admit of the Parts mentioned in the Question. And for our present use, we will imagine the Sum that was to be paid at 7 Months, 60 *l.*

Whereof $\frac{1}{2}$, that is, 30 *l.* must be paid content.

And $\frac{1}{3}$, which is 20 *l.* must be paid at 4 Months. Then see what the Interest of these two Parts comes to, for the time in which they were paid before they were due.

	l.		*Mo.*		*s.*
The Intereſt for	30	for	7	is	21
	20		3		06

Facit 27

Now that which remains for a full Reſolution of the Queſtion, is only this:

To find out how long time the remaining part of the Sum (which is 10 *l.*) muſt be retained, that the Intereſt thereof may come to 27 *s.*

And that is done by the Rule of Three, thus:

The Intereſt for 10 *l.* for 1 Month is 1 *s.*

If 1 *s.* —— 1 *mo.* —— 27 *s.*

Facit 27 *mo.*

Unto which add the 7 Months allowed at firſt —— 07

Facit 34 *mo.*

A Merchant hath owing him 500 *l.* to be paid him at 8 Months, and his Debtor doth agree to pay him 200 *l.* at 3 Months, on condition that he ſhall let him have the reſt for ſo much the longer: The Queſtion is, when he muſt pay the reſt, with Intereſt upon Intereſt? As

As in the former Queſtion, ſo in this,

Firſt, See what the Intereſt of 200 *l.* come to for 5 Months, paid before the time.

The Intereſt of 200 *l.* for 5 Months coms to 5 *l.* 0 *s.* 0 *d.*

Then by the Rule of Three ſee how man Months 300 *l.* 0 *s.* 0 *d.* muſt be let out, th ſo the Intereſt thereof may come to 5 *l.*

Facit 3 $\frac{1}{3}$ *Mnth*

To which add the 8

Facit 11 $\frac{1}{3}$

A Merchant hath owing to him 146 10 *s.* 9 *d.* to be paid $\frac{1}{3}$ content, $\frac{1}{4}$ at 3 Mo $\frac{1}{5}$ at 5 Months, and the reſt at 7 Mont and his Debtor doth agree to pay him all one Payment: I demand when that Payme muſt be made, that neither have advanta of the other?

		Mo.	*Mo.*	
$\frac{1}{3}$		0	0	
$\frac{1}{4}$	at	3	0	$\frac{3}{4}$
$\frac{1}{5}$		5	1	
$\frac{13}{15}$		7	1	$\frac{31}{60}$

Facit 3 $\frac{4}{15}$

A Merchant hath owing 243 *l* 19 *s.* 11 *d.* to be paid $\frac{1}{8}$ at 2 months, $\frac{1}{3}$ at 3 months, and the reſt at 6 months; the Debtor doth agree to pay $\frac{1}{2}$ content, and the other half at one Payment: I demand when the Payment muſt be made, that neither may be damnified?

Firſt, Do according to the former Rule, What is the indifferent time for the Payment of the whole Sum together?

Facit 4 $\frac{1}{3}$ *Mo.*

Now in regard that $\frac{1}{2}$ is paid in 4 months, and $\frac{1}{3}$ before it is due, it is reaſon, and according to Rule, that he ſhould have the other $\frac{1}{2}$ 4 months $\frac{1}{2}$ longer, which being added to the juſt time of Payment,

Facit 8 *Mo.* $\frac{5}{6}$.

CHAP.

CHAP. XXI.

The Rule of Rebate or Discount.

1. MErchants commonly vend their Commodities either for ready Money, or to be paid at a certain time or times appointed, at 3, 4, 6, 12 Months, or the like: But it often hapneth to be very convenient both to the Buyer and Seller, that this Money be paid in before it be due.

A Merchant sells Goods to the value of 100 *l.* to another, to be paid at 12 Months; but the other is willing upon an after-agreement to pay present Money upon Rebate, after 6 *l. per Cent. per Annum*, simple Interest: I demand the Sum paid and rebated?

Observe, Before you lay down the manner of Working, observe, that in all Rebatements there ought to be no more Money paid, than would augment it self to the Sum first due, if it were put forth to Interest: And this may also serve as a sure Proof of this Rule.

How to state the Question.

1. First, See what the Interest of 100 *l.* cometh to for the time demanded.

2. Add that Interest to the 100 *l.* which must be the first Number in the Question, 100 *l.* the second, and the Sum to be rebated the third.

Example.

l.	*l.*	*l.*
If 106	—— 100	—— 100
		100

10000

(3
46(6
xooooo(94 $\frac{8}{53}$ *facit.*
xoo6
xo

Which put forth to Interest would become 100 *l.*

I demand how much the Rebate of 289 *l.* 19 *s.* will amount to for 6 Months, after 8 *l.* *per Cent. per Annum* simple Interest?

		l.	*s.*
104	—— 100	—— 289	—— 19
		20	

5799
1co

579900

(1

(1
76(0
5998(0
57999(557|5
1044444 ——— ———
1000 278—15—$\frac{25}{26}$
11

	l.	*s.*	*d.*
Was to be paid—	289—	19—	00
Is to be paid ——	278—	15—	$\frac{25}{26}$
Is rebated———	11—	03—	$\frac{1}{26}$

I demand the Rebate of 321 *l.* 18 *s.* for 11 Months, after 6 *l. per Cent. per Annum* simple Intereſt?

To find the Intereſt of 100 *l.* for any Number of Months, you may take the Parts of 12 Months, as thus: If 6 *l.* be the Intereſt of 100 *l.* for 12 Months, then 6 Months will be the $\frac{1}{2}$ of that, 3 Months the $\frac{1}{2}$ of that $\frac{1}{2}$, and 2 Months the $\frac{1}{3}$ of that for 6 Months.

Example.

Mo.	*l.*	*s.*
12—	6—	00
———	———	
6—	3—	00
3—	1—	1
2—	1—	0
———	———	
5—	1	

105 *l.* 10 *s.*—— 100 *l.* —— 321 *l.* 18 *s.*

Facit 305 *l* —$\frac{3}{2}$

I demand the Discount of 378 *l.* for two 6 Months, after 6 *l. per Cent. per Annum* simple Interest?

By two 6 Months is understood that the $\frac{1}{2}$ *of the Money is to be paid at 6 Months, and the other* $\frac{1}{2}$ *at 6 Months after that.*

Mo.	*l.*	*l.*
12	6	378
6	3	189

l.	*l.*	*l.*
103	100	189

Facit 183 *l.* $\frac{51}{103}$

l.	*l.*	*l.*
106	100	189

Facit 178 *l.* $\frac{16}{53}$

I demand the Discount of 760 *l.* 16 *s.* for three 4 Months, after 6 *l. per Cent. per Annum* simple Interest?

Mo.	*l.*	*l.*	*s.*
12	6	$\frac{1}{3}$ 760	16
4	2	253	12
8	4	253	12
12	6	253	12
102	100	253	12

Facit 248 *l.* $\frac{32}{51}$ *for the first Payment at* 4 *Months.*

104 *l.* —— 100 —— 253 *l.* 12 *s.*

Facit 243 *l.* $\frac{11}{13}$ *for the second Payment at* 8 *Mo.*

106 *l.* —— 100 —— 253 *l.* 12 *s.*

Facit 239 *l.* $\frac{13}{53}$ *for the third Payment at* 12 *Mo.*

There are other ways for the working of Rebate; but I shall only instance one more, after 6 *l. per Cent.* As,

First, Multiply the Money and the Time.

Secondly, Divide that Product by 200 *and the Time, and the Quotient is the Sum to be paid upon Rebate.*

Example.

What is the Rebate of 100 *l.* for 12 *Mo.* after 6 *l. per Cent. per Annum*?

100
12

1200
(1(4
xxo (o(5 $\frac{140}{212}$ | $\frac{72}{106}$ | $\frac{35}{53}$
zxz

100 was to be paid.
5 $\frac{35}{53}$ is to be rebated.

l. 94 $\frac{18}{53}$ is to be paid.

And thus you may work any other Question after 6 *per Cent. &c.*

But if the Rebate be after 8 *l. per Cent.* then let the Divisor be 150 and the Time.

CHAP.

CHAP. XXII.

Of Exchange.

1. THe whole Courſe of Exchange is no more than to pay Money in one Place or Country, and receive in another the like Value or Sum, with Conſideration of either Loſs or Gain.

I might give you a Catalogue of Foreign Coins, but it will be to little purpoſe, becauſe they are not current Money, as our *Engliſh* is, but do riſe ſometimes higher in Value, and ſometimes lower, according as the Exchange runs. I ſhall therefore give you ſome choice Queſtions, and ſo leave you to enlarge as you ſee occaſion.

A Merchant delivered 340 *l. Sterling* at *London*, to receive the ſame at *Amſterdam*, the Exchange at 34 *s.* 7 *d. Flemiſh*, the 20 *s. Sterling*: I demand the ſame in *Flemiſh* Money.

2. Conſider that firſt and third Numbers muſt be of one Kind; if the firſt be *Sterling* Money, the third muſt be ſo too; if the firſt *Flemiſh*, the third muſt be *Flemiſh*.

If

s. Sterl.	*s.*	*d. Flem.*	*l. Sterl.*
If 20	34	7	340

12 — 20

415 — 6800

6800

332000

2490

282200|0

$\frac{1}{12}$ 141100 *d.*

1175|8—4 *d.*

Facit 587-18--4

Or thus:

340 *l.*—at 34 *s.* 7 *d.*

34

1360

1020

170

28—4 *d.*

1175|8-4 *d.*

587—18—4 *facit.*

A Me

A Merchant receiv'd a Bill of Exchange of 8000 Crowns at 5 *s.* $\frac{5}{7}$ *Sterling* : I demand the Sum in *Sterling* Money. Say,

If 1 be—— 5 *s.* $\frac{5}{7}$ ——what 8000?

Facit 2285 *l.* 14 *s.* 3 *d.* $\frac{3}{7}$.

A Merchant delivered 245 *l. Flem.* at *Middleborough*, to receive the ſame at *London*, the Exchange at 29 *s.* 5 *d. Flemiſh* the 20 *s. Sterl.* I demand the Sum *Sterling* Money?

If 29 *s.* 5 *d. Flemiſh* be 20 *s. Sterling*, what 245 *l. Flemiſh*?

Facit 166 *l.* 11 *s.* $\frac{157}{353}$.

A Merchant of *London* receiveth a Bill of Exchange from *Paris*, 460 *l. Sterling*, for the Value delivered there at 84 *d. Sterling* the 60 *s. Tournois*: I demand how much was delivered at *Paris*, *Tournois*, when 20 *s.* makes 1 *l. Tournois*?

84 *d.*——— 60 *s.*——— 460 *l.*

Facit 3942 *l.* 17 *s.* $\frac{1}{7}$ *Tournois.*

A Merchant at *London* delivered 80 *l. Sterling* by Exchange for *Frankford*, at 40 *d. Sterling* the Florine of 67 *Kreutzers* : The Queſtion is, how many Florines of 63 *Kreutzers* the Florine, he muſt receive at *Frankford*?

(4

(4
67 (1 $\frac{4}{67}$
63
40 —— 1 $\frac{4}{67}$ —— 80 *l.*
Facit 510 $\frac{10}{21}$.

A Merchant at *Dantzick* doth receive a Bill of Exchange from *London* of 3999 Florines, and is for 376 *l. Sterling* delivered at *London*: I demand at what price the Pound *Sterling* was deliver'd, when 30 groſs *Poliſh* make a Florine?

Facit 319 $\frac{13}{188}$ *groſs Poliſh.*

At *Antwerp* a Merchant receiveth a Bill of Exchange from *London* of 375 *l. Flemiſh*, for the Value received there at 27 *s.* 5 *d. Flem.* the 20 *s. Sterling*: I demand the Sum in *Sterling* Money that was delivered at *London*?

Facit 273 *l.* 11 *s.* $\frac{41}{329}$.

A Merchant at *London* doth deliver 370 *l. Sterling* by Exchange from *Roan*, at 73 *d. Sterling* for 50 *s. Tournois*: The Demand is, how much he muſt receive at *Roan, Tournois*?

Facit 60821 *s.* $\frac{67}{73}$ *Tournois*..

A *Spa-*

A *Spaniſh* Merchant doth receive a Bill of Exchange from *London* of 700 Duckets, and is for 196 *l.* 15 *s.* delivered at *London.* I demand at what Price the Ducket was delivered?

Facit 5 *s.* $\frac{87}{140}$.

III. *How to know at what rate we make the Exchange, tranſporting Money or Wares from one Country to another.*

If a Ducket of *Venice* be worth 120 *s.* and at *London* 5 *s.* 7 *d.* at what Price is the Exchange made for the Ducket of 112 *s.* in tranſporting from *Venice*?

120——5 *s.* 7 *d.*——112

Facit 5 *s.* 2 *d.* $\frac{8}{15}$.

If a *French* Crown at *Hamborough* be worth 45 *s. Lubiſh*, and an Angel be worth 78 *s.* and at *London* a *French* Crown is worth 6 *s. Sterling*, and the Angel 11 *s. Sterling*: Whether is it better to bring Angels or *French* Crowns from *Hamborough* to *London*?

It is better to bring French *Crowns by* $\frac{27}{78}$.

If a Piece of Seaige be worth 28 *s. Sterling*, and at *Frankfort* it is worth (all Charges

Charges abated) 17 Florines at 60 *Kreutzers* the Florine, at what Price do I make the Exchange for 66 *Kreutzers* in carrying Searges from *London* to *Frankford*?

Facit 1 *s.* $\frac{207}{355}$.

If a Mark at *Hamborough* be worth 33 *s. Lubiſh*, and at *London* 3 *s.* 7 *d.* at what Price is the Exchange made for 1 *l. Sterling*, in bringing Marks from *Hamborough* to *London*?

Facit 184 *s.* $\frac{8}{43}$ *Lubiſh.*

If a *French* Crown be worth 7 *s.* $\frac{3}{5}$ *Flemiſh* at *Antwerp*, and 6 *s.* at *London*, at what Price do I make the Exchange for 1 *l. Sterling* in bringing *French* Crowns from *Antwerp* to *London*?

Facit 25 *s.* $\frac{1}{5}$ *Flemiſh.*

If a Dollar at *Dantzick* be worth 39 Groſs, and at *London* 4 *s.* 8 *d.* at what Price do I make the Exchange for 1 *l. Sterling*, tranſporting Dollars from thence to *London*?

Facit 167 $\frac{8}{58}$ *Groſs.*

CHAP.

CHAP. XXIII.

Of Loſs and Gain.

1. I Need not go about to acquaint you with the Meaning of this Rule, becauſe the Words themſelves are ſufficient to inform you. And for its Nature, I ſhall ſhew it you by many and various Queſtions, which indeed are ſomething hard to apprehend, without the well minding of theſe four principal Heads, which being well underſtood, will carry you thro' the Difficulties thereof.

As,

Firſt, To know what is gain'd or loſt *per Cent.*

Secondly, To know how it ſhall be ſold for to gain or loſe ſo much *per Cent.*

Thirdly, Having gained or loſt ſo much *per Cent.* to know what it coſt.

Fourthly, There being ſo much gained *per Cent.* when ſold for ſuch a Rate; to know what is gained *per Cent.* when ſold for more, or what is loſt *per Cent.* when ſold for leſs.

Of

Of these in Order.

First, To know what is gained or lost *per Cent. per* Pound, *per* Ell, *per* Yard, *&c.*

Example.

If 1 lb. of Tabacco cost 18 *d.* and is sold for 21 *d.* I demand how much is gained *per Cent? First, See what the Gain or Loss is by Subtraction.*

21
18

3

Then let the Price it cost be the first Number in the Rule of Three, the Gain or Loss the second, and 100 l. *the third.*

If 18 gain —— 3 *l.* —— what 100?

Facit 16 *l.* 13 *s.* 4 *d.*

If a Leather-seller buy a Parcel of Leather for 2 *s.* 10 *d. per* Skin, and selleth the same again for 3 *s.* 2 *d.* what doth he gain *per Cent?*

s.	*d.*
3 —	2
2 —	10
0 —	4

If 34 *d.* gain 4 *d.* what 100 *l?*

Facit 11 *l.* 15 *s.* 3 *d.* $\frac{9}{17}$.

If

If I buy an Ell of *Holland* for 6 *s.* 7 *d.* and ſell it again for 5 *s.* 9 *d.* I demand how much the Loſs is *per Cent?*

s.	*d.*
6	7
5	9

10

If 6 *s.* 7 *d.* — 10 *d* — 100 *l.*

Facit 12 *l.* 13 *s.* 1 *d.* $\frac{77}{79}$.

If 1 ℔. coſt 10 *d.* and is ſold again for 8 *d.* the Queſtion is, What is loſt *per Cent?*

If 10 *d.* loſe — 2 *d.* — what 100 *l?*

Facit 20 *l.*

If a Piece of Cloth, containing 24 Yards, coſt 42 *s.* and 1 Yard is ſold for 2 *s.* 8 *d.* the Queſtion is, How much is gained or loſt *per Cent?* *Gained* 52 *l.* 7 *s.* 7 *d.* $\frac{3}{7}$ *per Cent.*

If a Piece of Silk, containing 36 Yards, coſt 9 *l.* and 1 Yard is ſold for 9 *s.* 8 *d.* I demand whether I gain or loſe, and how much *per Cent?* *Facit* 93 *l.* 6 *s.* 8 *d. Gain.*

A Draper hath a Piece of Cloth containing 30 Yards, coſt him 14 *s.* the Yard, and another Cloth containing 19 Yards, coſt 7 *s.* the Yard, and he ſells them one with another for 13 *s.* the Yard: I demand whether he

e doth win or lose, and how much *per Cent.*
—1 $\frac{5}{7}$ *facit Gains per Yard.*
Facit 15 *l.* 3 *s.* 9 *d.* $\frac{3}{5}\frac{1}{5}\frac{5}{3}$ *Gains per Ell.*

If 1 Yard cost 3 *s.* ready Money, and is ld again for 3 *s.* 4 *d.* for 8 Months, I de- and how much is gained *per Cent. per Ann.* ithout Interest upon Interest?
Facit 16 *l.* 13 *s.* 4 *d. Gains.*

If 1 Yard cost 9 *s.* ready Money, and is ld for 8 *s* the Yard for 16 Months, the uestion is, how much is lost *per Cent. per nnum*, without Loss upon Loss?
Facit 11 *l.* 2 *s.* $\frac{2}{9}$ *for* 16 *Months.*
Lost —8 *l.* 6 *s.* $\frac{1}{3}$ *for* 12 *Months.*

If I buy Cloth for 6 *s.* a Yard for 8 Mon. nd sell the same again for 5 *s.* 6 *d.* ready oney, how much do I lose *per Cent. per nnum*?
Questions of this Nature are to be resolved two Workings by the Rule of Three, thus:

If 6 *s.* lose —— 6 *d.* —— what 100 *l.*
Facit 2000 *d.*
If 8 Mon. lose—2000 *d.*—what 12 Mon.
Facit 12 *l.* 10 *s.*

If

If I buy Cottons for 3 *s.* a Yard for Months, and sell them again for 3 *s.* 2 *d.* ready Money; the Question is, How much I gain *per Cent.* allowing 6 *per Cent.* Interest.

First, See what they cost in ready Money Thus:

102 *l.*—10 *s.*——100 *l.*——3 *s.*

Facit 2 *s.* 11 *d.* $\frac{5}{41}$

2 *s.* 11 *d.* $\frac{5}{41}$——2 *d.* $\frac{36}{41}$——100 *l.*

Facit 8 *l.* 3 *s.* 10 *d* $\frac{2}{3}$ Gain *per Cent.*

A Grocer doth sell Cloves for 4 *s. per* lb. ready Money: The Question is, how long time he must demand, when he doth buy the same Cloves at 3 *s.* 8 *d.* the Pound, to gain 13 *l. per Cent. per Annum*, without Gain upon Gain, at 6 *per Cent.* Interest?

First, See what the Gain is, if bought at 3 *s.* 8 *d.*

Thus:

3 *s.*—8 *d.*——4 *s.*——100 *l.*

Facit 109 $\frac{1}{11}$

Here is gained but 9 *l.* $\frac{1}{11}$; but he must gain 13 *l.* that is 3 *l.* $\frac{10}{11}$ more, which must be gained by Time: Therefore say,

If 6 *l.*——12 *Mo.*——3 *l.* $\frac{10}{11}$.

Facit 7 *Mo.* $\frac{9}{11}$.

A Lin-

A Linnen-Draper hath several sorts of Cloth, *viz.* 470 Ells at 2 *s.* 10 *d. per* Ell ready Money, 730 Ells at 2 *s.* 6 *d. per* Ell ready Money, and 179 Ells at 3 *s.* 10 *d. per* Ell ready Money, and he sells the Ell one with another for 2 *s.* 2 *d.* to be paid $\frac{1}{2}$ at 5 Mon. $\frac{1}{4}$ at 6 Mon. and the rest at 9 Mon. Interest at 6 *l. per Cent.* I demand what is lost *per Cent.*

Ells.		*s.*	*d.*		*l.*	*s.*	*d.*
470		2	10		66	11	08
730	at	2	6	is	91	05	00
179		3	10		34	06	02
1379 Ells cost					192	02	10

1379 Ells sold at 2 *s.* 2 *d.* is 149 *l.* 7 *s.* 10 *d.*

Which Sum being to be received as above-said, will by Rebate at 6 *l. per Cent.* come to no more than 144 *l.* 17 *s.* 4 *d.* Then say,

If 192 *l.* 2 *s.* 10 *d.*—100 *l.*—144 *l.* 17 *s.* 4 *d.*

Facit 24 *l.* 12 *s. per Cent.* Loss.

The second Head.

To know how a Commodity must be sold to gain or lose so much per Cent.

Example.

If 1 ℔. of Nutmegs cost 9 *s.* 2 *d.* how much must it be sold for to gain 6 *l. per Cent?*

Let

Let 100 l. *be the first Number in the Rule of Three, the Price the second, and* 100 l. *with the Profit added, or the Loss subtracted, the third Number.*

If 100 ℔. be 9 *s.* 2 *d.* price, what 106 ℔?

Facit 9 *s.* 8 *d.* $\frac{3}{5}$.

If a Barrel of Gunpowder cost 3 *l.* how must it be sold to lose 9 *l. per Cent.*

If 100 —— 3 *l.* —— what 91 *l.*

Facit 2 *l.* 14 *s.* 7 *d.* $\frac{1}{5}$

If 1 Gallon of Sack cost 5 *s.* 10 *d.* for how much must it be sold to lose 8 *l. per Cent?*

If 100 *l.* —— 5 *s.* 10 *d.* —— 92 *l.*

It must be sold for 5 *s.* 4 *d.* $\frac{2}{5}$

If 90 Ells of Cambrick cost 60 *l.* for how much must 1 Yard be sold to gain 18 *l. per Cent?* *It must be sold for* 12 *s.* 7 *d.* $\frac{1}{25}$.

If a Bag of Hops, weight 16 *C.* 1 *qr.* 12 ℔. cost 27 *l.* 6 *s.* 8 *d.* for how much must the *C.* weight be sold to lose 8 *l. per Cent?*

Facit cost per C. 1 *l.* 13 *s.* 3 *d.* $\frac{11}{239}$.

Sold to loss per C. 1 *l.* 10 *s.* 8 *d.* $\frac{1104}{1145}$.

A Sugar-baker hath 736 ℔. of Sugar that cost 13 *d.* a Pound, and 137 ℔. 12 *d.* a Pound;

I de-

I demand how he muſt ſell the Pound one with another, to gain 9 *l. per Cent.* Firſt ſee what one Pound coſt. *Facit* 12 *d.* $\frac{736}{873}$.

It muſt be ſold for, to gain 9 *l. per Cent.* 1 *s.* 1 *d.* $\frac{21802}{21825}$.

If a Pound of Mace coſt 8 *s.* how muſt it be ſold to gain 24 *l. per Cent?*

Facit 9 *s.* $\frac{23}{25}$.

If 5 Yards coſt 5 *l.* ready Money, for how long time muſt it be ſold for 95 *s.* to loſe 20 *per Cent.* without Loſs upon Loſs?

If I lay out 100 *l.* ready Money, and muſt receive but 95 *l.* there is 5 *per Cent.* Loſs; but I muſt loſe 20 *l. per Cent.* that is, 15 *l.* more, ſo that I muſt ſell my Goods as if I ſold that which coſt me 100 *l.* for 80 *l.* Therefore ſee in what time 80 *l.* will amount to 95 *l.* at 6 *per Cent.* and that will anſwer the Queſtion.

If 100 *l.* loſe 6 *l.* in 12 Months, in what time ſhall 95 *l.* loſe 15 *l?*

Or thus:

If 100 *l.* —— 6 *l.* —— 80 *l.*

Facit 4 *l.* 16 *s.*

4 *l.* 16 *s.* —— 12 —— 15 *l.*

If 1 ℔. cost 23 *d.* ready Money, for how long time must it be sold for 25 *d.* to gain 11 *l. per Cent. per Annum.* at 6 *l. per Cent?*

Suppose I sell for 12 Months time, then I gain in the Price 8 *l.* $\frac{16}{23}$.

As thus:

If 23 *d.* —— 100 *l.* —— 25 *d.*

Facit 108 $\frac{16}{23}$.

But I must gain 11 *l.* that is, 2 $\frac{7}{23}$ more; therefore this must be gained by Time:

Thus:

6 *l.* —— 12 *Mon.* —— 2 *l.* $\frac{7}{23}$

Facit 4 *Mon.* $\frac{84}{138}$.

This 4 Mon. $\frac{84}{138}$ must be subtracted from 12 Months, and the Remainder is the Answer to the Question.

Facit 7 *Mon.* $\frac{54}{138}$.

If 1 Yard cost 2 *s.* 9 *d.* ready Money, at what rate must it be sold for 3 Mon. $\frac{1}{2}$, to lose 8 *l. per Cent?*

First, See what Rate it must be sold for in ready Money to lose 8 *l. per Cent.*

Thus:

100 *l.* —— 33 *d.* —— 92 *l.*

Facit 30 *d.* $\frac{9}{25}$.

If 30 *d.* $\frac{9}{25}$ be a ready Money Price, I must sell

sell it for more, in regard I must stay 3 Mo. $\frac{1}{2}$ for my Money: Therefore let 100 *l.* be your first Number, and 100 with the Interest for 3 Mo. $\frac{1}{2}$ be the second Number, and the last *Facit* your third Number, thus:

100 —— 101 *l.* 15 *s.* —— 30 *d.* $\frac{9}{25}$

Facit 30 *d.* $\frac{8913}{10000}$

A Mercer buyeth Silk at 14 *s.* a Yard for 7 Months; at what Rate must he sell it again for ready Money to gain 16 *per Cent.* without Gain upon Gain?

First, See what the Yard is worth in ready Money, thus:

103 *l.* —— 10 *s.* —— 100 *l.* —— 14 *s.*

Facit 13 *s.* $\frac{109}{207}$

Then say, If 100 *l.* — 13 *s.* $\frac{109}{207}$ —— 116 *l.*

Facit 15 *s.* $\frac{143}{207}$

The third Head.

When there is gain'd or lost per Cent. *to know what the Commodity cost.*

Example.

If 10 Yards of Cloth be sold for 16 *s.* per Yard, and there be 6 *l.* 10 *s.* Loss *per Cent.* the Question is, how much the 10 Yards cost?

First, Subtract the Loss from the 100 *l.*

6 —— 10

93 —— 10

2. Let the Remainder of 100 *l.* when there is Loſs, and the Gain added to 100 *l.* when there is Gain, be the firſt Number; let the Price be the ſecond Number, and 100 *l.* the third.

If 93 *l.* 10 *s.* —— 8 *l.* —— 100 *l.*

Facit 8 *l.* 11 *s.* $\frac{23}{187}$.

If 20 ℔ of Cloves be ſold for 7 *s.* the Pound, and I gain 9 *l. per Cent.* the Queſtion is, how much the whole 20 ℔. coſt me?

20
7
14|0
7

109 *l.* —— 7 *l.* —— 100 *l.* *Facit* 6 *l.* $\frac{46}{109}$.

If I ſell 28 Ells of Cloth for 4 *s. per* Ell, and thereby loſe 24 *per Cent.* I demand what the whole Piece coſt?

76 *l.* —— 112 *s.* —— 100 *l.* *Facit* 7 *l.* 7 *s.* $\frac{7}{19}$.

If 13 C. $\frac{1}{2}$ of Indigo be ſold for 36 *l.* and I gain 13 *l. per Cent.* I demand how much the C. weight coſt?

113 —— 36 —— 100 *Facit* 32 *l.* $\frac{14}{113}$.

If 276 Fother of Lead, each 19 C. $\frac{1}{2}$, be ſold for 256 *l.* at 5 Mo. and I gain 11 *per Cent.*

per

per ann. the Question is, how much the whole cost ready Money?

$12\frac{5}{12}$ —— 256 —— 100 *Facit* 244 $\frac{96}{251}$

The Fourth Head.

If Wares sold at such a Rate there is so much gained or lost per Cent. *how to know what would be gained or lost if sold at another Rate.*

Example.

If Cloth sold at 8 *s.* the Yard be 10 *per Cent.* Profit, what Gain or Loss *per Cent.* should I have had, if sold at 7 *s. per* Yard?

In Questions of this nature, let the first Price be the first Number, 100 l. *with the Profit added or Loss subtracted, the second Number, and the other Price the third Number.*

Example.

If 8 *s.* —— 100 *l.* —— 7 *s.* *Facit* 96 *l.*

Lost per Cent. 3 *l.*

If 1 Gallon of Wine be sold for 9 *s.* and lose 8 *per Cent.* how much shall I gain or lose when 3 Gallons are sold for 25 *s.* 10 *d?*

If 27 *s.* —— 92 *l.* —— 25 *s.* 10 *d.*

Facit 11 *l.* $\frac{79}{81}$ *per Cent. Lost*

If 10 Yards be sold for 4 *l.* 10 *s.* and I lose 12 *per Cent.* what shall I gain or lose if I sell the same for 9 *s.* 9 *d. per* Yard?

9 *s.* —— 88 *l.* —— 9 *s.* 9 *d.*

Facit 4 *l.* $\frac{2}{3}$ *Loss per Cent.*

CHAP. XXIV.

Of Alligation.

I. *Alligation* is ſo named becauſe it teacheth to knit or bind together divers Things of unequal Prices, whereby to find how much of each muſt be taken according to the Queſtion propounded.

It is commonly divided into two Parts, *viz.*

Alligation Medial, and
Alligation Alternate.

II. *Alligation Medial* ſimple in it ſelf, is no more than to diſcover or find out a common Medium, Rate, Price, or Proportion in the Mixture of divers Things together, which is performed by reducing the ſeveral Prices to one Denomination.

Then multiply the Quantity of each Parcel by its Price, and add all the Products together, the which Total divide by the Number of all the Parcels that are to be mixed, and the Quotient is the Anſwer to the Queſtion demanded. For,

As the whole Quantity is to the whole Price, ſo is 1 *to its own Price.*

Ex-

Example. A Meal-man hath ſeveral ſorts of Meal of ſeveral Prices, and would mix them ſo, that the Quantity mixed might be one common Price, *viz.*

3, 4, 6 Buſhels at 3 *s.* 5 *d.*, 5 *s.* 6 *d.*, 4 *s.* 8 *d.* a Buſhel.

Now the Queſtion is, what one Buſhel of this Mixture is worth?

Buſh.	*s.*	*d.*	*Buſh.*	*s.*	*d.*	*Buſh.*	*s.*	*d.*
3 at	3	5	4 at	5	6	6 at	4	8
3			5			4		
9			20			24		
1			2			3		
0	3					1		
	22 *s.*							
10 *s.* 3 *d.*				28				

s.	*d.*	*buſh.*
10	3	3
22	0	4
28	0	6
6	0	13

3 *l.* 0 *s.* 3 *d.*

l.	*s.*	*d.*	
13	3	0	3 — 1

Facit 4 *s.* 7 *d.* $\frac{8}{13}$ *per Buſhel*

An Hoſtler mixed Provender for Horſes *viz.*

		s.	*d.*
5	Oats	3	6
3	Oats	4	8
2	Malt	2	2
4	Beans	5	3

per Buſhel

The Queſtion is, what 1 Peck of this Mixture is worth?

buſh.	*s.*	*d.*	*buſh.*	*s.*	*d.*	*buſh.*	*s.*	*d.*	*buſh.*	*s.*	*d.*
5 at	3	—6	3 at	4	—8	2 at	2	—2	4 at	5	—2

Reduce each Quantity into Pecks, each Price into Pence, and multiply one by the other: Then ſay as before,

If 56 Pecks——682 *d.* 1 Peck *facit* 12 *d.* $\frac{5}{28}$.

How to prove Alligation Medial.

Compare the total Value of the ſeveral Mixtures with the Value of the whole Mixture, and if they come both alike, the Work is true; as in the former *Example* may appear.

		s.	*d.*		*l.*	*s.*	*d.*
5	Buſhels at	3	—6	——	0	—17	—6
3		4	—8	——	0	—14	—0
2		2	—2	——	0	—04	—4
4		5	—3	——	1	—01	—0
					2	—16	—10

(1
8 (0
68x (5|6
xxx
x 2—16—10

An

An Alehouſe keeper mixeth 3 ſorts of Al
together, *viz.* 15 Gall. at 4 *d.* $\frac{1}{2}$ *per* Gall. 2
Gall. at 5 *d. per* Gall. 20 Gall. at 6 *d. per* Gal
The Queſtion is, what one Gallon of th
Mixture is worth? *Facit* 5 *d.* 0 *qrs.* $\frac{5}{7}$

A Refiner having 10 ℔. of Silver Bullion
8 Ounces fine, 12 ℔. of 6 Ounces fine, an
11 ℔. of 9 Ounces fine, is deſirous to melt a
together, and to know what Fineneſs a Poun
weight of this Maſs ſhall be?

l. *l.* *l.*

10 — 12 — 11
8 — 6 — 9

80 — 72 — 99

11	80
12	72
10	99
33	251

33 — 251 — 1 *facit* 7 oz. $\frac{20}{33}$ *fine.*

Or thus:

10 + 12 + 11 = 33
10 x 8 = 80
12 x 6 = 72
11 x 9 = 99

Then ſay,
If 33 — 251 — 1
Facit 7 oz. $\frac{20}{33}$ *fine.*

Note, That a
thus doth ſignifie
dition, and two Lin
thus = *Equality*
Equation, but an
thus, *Multiplication*

III. It will be neceſſary here to acquai

you, that as Silver is eſtimated 12 Ounces to the Pound, and 20 Peny-weight to the Ounce, ſo an Ounce of Gold is divided into 24 Parts called Carects. Now Refiners, Goldſmiths, and Mint-maſters do diſtinguiſh the different Fineneſs of either, according as it endureth the Fire. As for example: If an Ounce of Gold being tried, loſeth 3 Carects, it is eſtimated 21 Carects fine; if it loſeth 10 Peny-weight, it is eſteemed 11 Ounces and 10 Peny-weight fine, *&c.*

A Goldſmith is to melt 9 lb. 4 ℥. $\frac{1}{2}$ of Gold Bullion of 16 Carects fine, with 7 lb. 6 ℥. of 22 Carects fine: The Queſtion is, how many Carects fine a Pound of this Mixture is worth?

Reduce them into $\frac{1}{2}$ Ounces, and work as before.

Facit 18 *Car.* $\frac{54}{81}$ *fine.*

Or thus:

225 x 16 = 3600 225 + 180 = 405
180 x 22 = 3960

Then ſay,

If 405 —— 7560 — 1 *Facit* 18 *Car.* $\frac{11}{81}$ *fine.*

A Mint-maſter hath 60 lb. weight of Gold of

of 23 Carects fine, and 80 lb. weight of 1 Carects fine; the Queſtion is, Whether ther ought any Alloy to be mixed with it, to make a Pound of this Mixture to be 21 Carects fine.

An Alloy is a Mixtu of ſome baſer Metal, Copper, &c. to modera the Fineneſs of it.

23	19	1380	6
60	80	1520	8
1380	1520	2900	14

140 ——— 2900 ——— 1 *facit* 20 $\frac{5}{7}$ C rects fine; but it ſhould be 21 Carects fine.

Wherefore I conclude this Mixture is n fine enough by $\frac{2}{7}$ of 20 Carects fine; ther fore no Alloy is to be uſed, but more Gold be put in.

The ſecond Part of the Rule of Alligation.

1. The former Rule required only a co mon Rate or Price from the whole of ſeve Quantities mixed together; but this requi a Price and Quantity in general, compoſ of ſuch Particulars as the Mixture is to made of, and the Parts to be taken propo onably according to the Price, Quantity, Quality of each one.

Example.

A Tabacconiſt having ſeveral ſorts of Tabaccoes, as ſome at 2 *s.* a Pound, others at 3 *s.* a Pound, others at 6 *s.* a Pound, and the beſt at 7 *s.* a Pound, and is deſirous to mix 112 Pound together, ſo that he might ſell the whole Mixture for 4 *s.* a Pound; the Queſtion is, what Quantity of each muſt be taken to make up this Mixture?

In order to the working of this Queſtion, and others following,

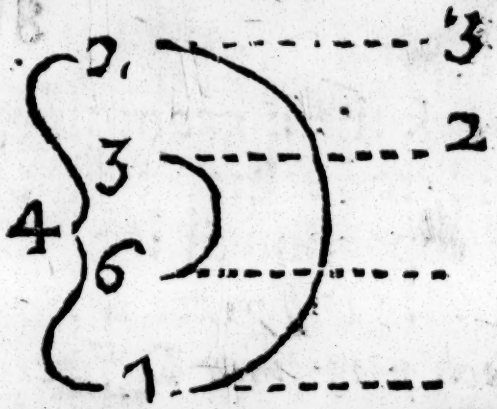
Firſt, Set down the common Number (or Price) propounded (towards the left hand) which is 4 *s.* and likewiſe the Prices given, *viz.* 2 *s.* 3 *s.* 6 *s.* 7 *s.* thus orderly one under another, as you have learned in Addition.

$$4 \left\{ \begin{matrix} 2 \\ 3 \\ 6 \\ 7 \end{matrix} \right.$$

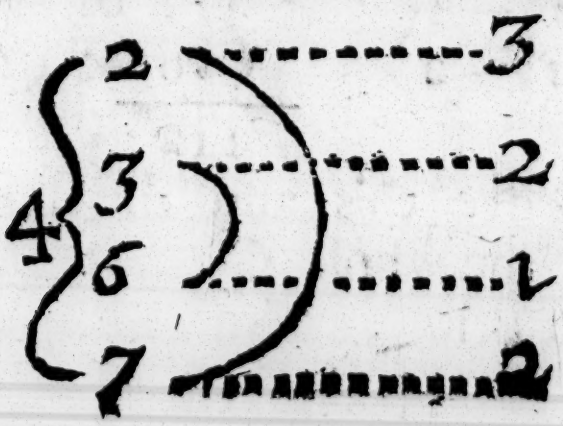
2. Obſerve what Sums are greater, and what are leſſer than the common Number, and couple a greater and a leſſer together, by making a Semicircle from one to the other; for two greater or two leſſer cannot be mix'd together, becauſe two leſſer being thus taken, can never make ſo many as the com-

common Number, and two greater will be too many.

3. Having thus linked them, observe what the Difference is between each of the greater Sums and the common Price, the which Difference is set directly against his Fellow which is linked with him.

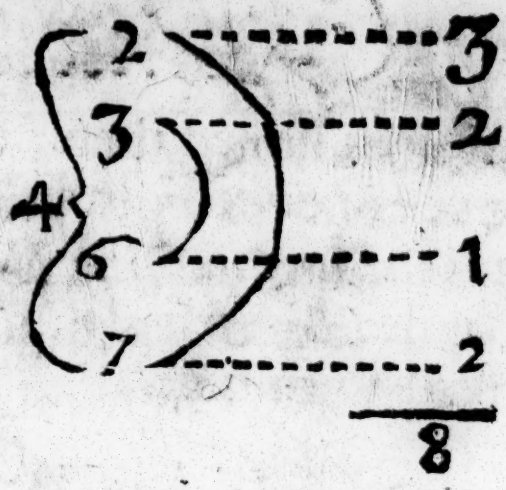


Then likewise mark the Difference between the lesser Numbers and the common Number, and set each Difference thereof against that which is linked with it.



Last

Laſtly, Add all the Differences into one Sum, which ought to be the firſt Number in the Rule of Three, and the whole Quantity to be mixed the ſecond, and each particular Difference the third.



Then work theſe according to the Rule of Three, and the fourth Number will declare the exact Proportion of the Mixture. For,

As the whole Difference is to the whole Quantity, ſo is each particular Difference to each particular Mixed.

		l.	
8—112—3	*facit*	42	for the firſt ſort.
8—112—2		28	of the ſecond.
8—112—1		14	of the third.
8—112—2		28	of the fourth.
		112	

To prove this and the like Queſtions, multiply the whole Quantity mixed by the common Price, as here 112 by 4, *facit* 448.

2. Mul-

2. Multiply all the particular Quantities found by its own Price, as 42 by 2, 28 by 3, *&c.* and if the Total of all the Products agree with the former Sum (448) your Work is well done.

A Vintner hath 4 ſorts of Wine of ſeveral Prices, *viz.* ſome of 15 *d.* a Gallon, 17 *d.* a Gallon, 19 *d.* a Gallon, and 23 *d.* a Gallon, of which he is minded to mix the Quantity of 32 Gallons: The Queſtion is, how many Gallons he muſt take of each ſort to make the Gallon worth but 18 *d.*

				Gall.
10	32	1	*facit*	$3\frac{1}{5}$
10	32	5		16
10	32	3		$9\frac{3}{5}$
10	32	1		$3\frac{1}{5}$
				32

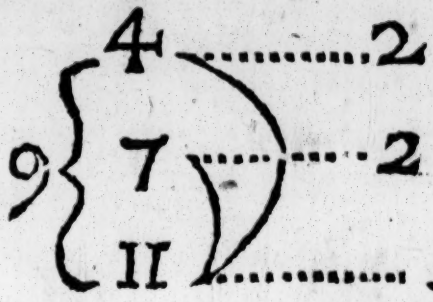
A Druggiſt had 3 ſorts of Drugs, one was valued at 4 *s.* the Pound, another ſort at 7 *s.* the Pound, the third ſort at 11 *s.* a Pound; out of theſe ſorts he made two Parcels, either of them to be 30 Pound weight, whereof one of them thus mixed to be ſold for 9 *s.* the Pound, and the other for 10 *s.* the Pound: How many Pound muſt be taken of either ſort to make each Mixture?

The Price propounded in the firſt Propoſition is 9 *s.* and in the other 10 *s.* Likewiſe the Prices given are 4 *s.* 7 *s.* and 11 *s.* But ſeeing two of theſe given Prices are leſſer than the common Price, I cannot proceed to the former Example: Therefore I couple the two leſſer with the greater, and their Differences I ſet againſt the greater, and the Differences of the greater againſt the two leſſer; then work as before. For,

As 11 *the whole Difference, is to* 30 *the whole Quantity; ſo is* 2 *the firſt Difference, unto* 5 *and* $\frac{5}{11}$ *for its Quantity.*

Pro-

Propoſition I.

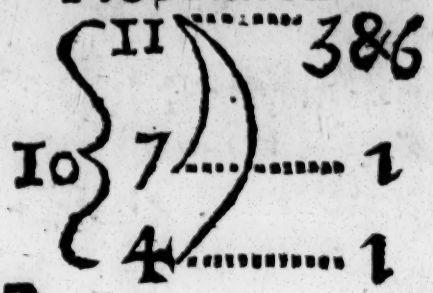


11

11—30—2 *fa.* $5\frac{5}{11}$
11—30—2 *fa.* $5\frac{5}{11}$
11—30—7 *fa.* $19\frac{1}{11}$

30

Propoſition II.

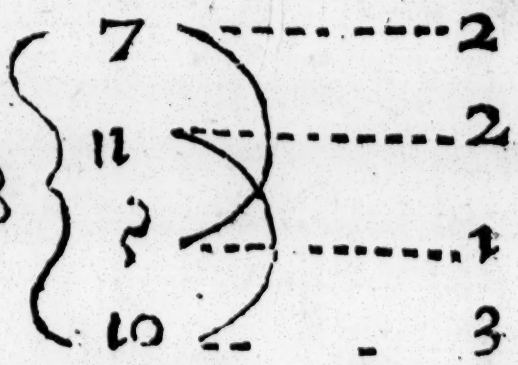


11

11—30—9 *fa.* $24\frac{6}{11}$
11—30—1 *fa.* $2\frac{8}{11}$
11—30—1 *fa.* $2\frac{8}{11}$

30

Barley at 7 Groats the Buſhel, Wheat at 11 Groats the Buſhel, Rye at 5 Groats the Buſhel, and Oats at 10 Groats the Buſhel, are ſo to be mixed, as 100 Buſhels of the Mixture may be ſold for 8 Groats the Buſhel: The Queſtion is, how much muſt be taken of each ſort?



9 — 100 — 3
9 — 100 — 2
9 — 100 — 1
9 — 100 — 3

facit

$33\frac{3}{9}$ Barley.
$22\frac{2}{9}$ Wheat.
$11\frac{1}{9}$ Rye.
$33\frac{3}{9}$ Oats.

100

How

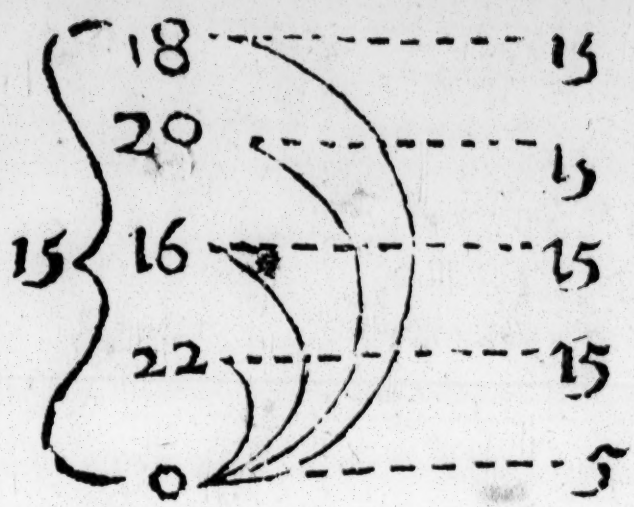
How much Alloy muſt I mix with Bullion of 11 Ounces $\frac{5}{6}$ fine, to abaſe the Bullion to 6 Ounces $\frac{1}{3}$ fine?

Ounces.	*Ounces.*	
$6\frac{1}{3}$	$11\frac{5}{6}$	$6\frac{1}{2}$
	0	$5\frac{1}{3}$

By this Alligation there muſt be taken 5 Ounces and $\frac{1}{3}$ of Alloy, to mix with the 6 *oz.* $\frac{1}{3}$ of Bullion.

A Goldſmith hath 4 ſorts of Gold, one finer than another, whereof one is 18 Carects fine, another 20, a third 16, and the fourth 22 Carrects fine: All theſe he would mix with ſuch an Alloy, as that the whole Mixture of 150 *oz.* ſhould be 15 Carects fine: The Queſtion is, How much muſt be taken of each ſort?

To anſwer this, and others of this nature, ſet down, as before, the Rate demanded at the left hand, and the Particulars under one another, and ſubſcribe a Cypher under all (for the Alloy unknown) to ſet the Alloys Difference, which is 15, againſt all the other Sums, according to the Example. Then work as before, ſaying, *As* 76, *the whole Difference, is to* 150, *the whole Quantity; ſo is each particular Difference, to the Quantity ſought.*



76 —— 150 —— 15 *facit* 29 $\frac{23}{38}$
76 —— 150 —— 15 *facit* 29 $\frac{23}{38}$
76 —— 150 —— 15 *facit* 29 $\frac{23}{38}$
76 —— 150 —— 15 *facit* 29 $\frac{23}{38}$
76 —— 150 —— 16 *facit* 31 $\frac{22}{38}$

150

A Refiner hath ſeveral ſorts of Bullion, *viz.* 30 ℔. of 6 *oz.* fine, 6 of 8 *oz.* fine, 12 ℔. of 9 *oz.* fine; and he would ſo mix them together, that a Pound thereof ſhould bear 6 Ounces fine. The Demand is, Whether any Alloy ought to be mix'd with it, and how much?

Firſt, See by *Alligation Medial* what Fineneſs an Ounce of this Mixture will bear when mixed together; then work as in the laſt Queſtion ſave one.

			180	30
30	16	12	128	16
6	8	9	108	12
180	128	108	416	58

(1
(0
416 (7 oz. $\frac{5}{29}$
58

Therefore it is manifeſt that Alloy muſt be mixed to Alloy from 7 *oz.* $\frac{5}{29}$ to 6 *oz.* which is to be done thus; and you will find for every 6 Ounces of Bullion he muſt take 1 *oz.* $\frac{5}{29}$ of Alloy to mix with it.

6 { 7 $\frac{5}{29}$)—6
{ 0 —— 1 $\frac{5}{29}$

7 $\frac{5}{29}$

CHAP. XXV.

Of Inſtructions for the Meaſuring of any Superficies, Board, Glaſs, Hangings, Pavements, &c.

1. OBſerve, That Board and Glaſs are uſually meaſured by the Foot, and the Foot containeth 144 Inches.

There

There is a Table 24 Foot in length, and 3 Foot wide; I demand how many Foot is contained therein?

The Rule is,

Multiply the Length by the Breadth, and the Product giveth the Content of the whole.

24
3

Facit 72 *Foot.*

There is a Table of 20 Foot 9 Inches long, and 3 Foot 8 Inches broad; how many Foot doth it contain?

Reduce them into Inches, and multiply as before.

Facit 76 *Foot* $\frac{1}{12}$.

How to measure Glass.

There is a House hath 26 Panes of Glass in the Window, each Pane being 2 Foot 3 Inches long, and 18 Inches wide: The Question is, How many Foot of Glass is contained in all?

Facit 87 *Foot* $\frac{3}{4}$.

Pavements and Hangings are usually measured by the Yard.

One Yard in Length is 3 Foot.

One Yard square upon the Superficies is 9 Foot.

How

How to measure Pavements.

There is a Piece of Ground to be paved containing 49 Yards in length, and 31 Yard in breadth; how many Yards is contained therein? *Facit* 1519 *Yards*

A Gentleman had his Door paved, being 37 Yards 2 Foot one way, and 7 Yards 1 Foo the other way: I demand how many Yard are there in all? *Facit* 276 *Yards* $\frac{2}{9}$

A Sute of Hangings 45 Yards $\frac{1}{2}$ long, and 2 Yards $\frac{1}{4}$ broad; how many Yards are there in all?

Divide by 16, because 16 Quarters is Yard square. *Facit* 102 *Yards* $\frac{3}{8}$

Instructions for the measuring of Solids, as Timber and Stone, &c.

12 Inches is 1 Foot in length.
144 Inches is 1 Foot square Superficies.
1728 Inches is 1 Foot solid.

There is a Stone of 4 Foot long, 3 Foo broad, and 2 Foot deep; I demand how ma ny square Foot is contained therein?

T

The Rule is,

Multiply the three Dimensions one into another, and the Product is the Answer.

Facit 24 *Foot.*

A Stone of 5 Foot 9 Inches long, 4 Foot 7 Inches broad, 2 Foot 8 Inches deep; I demand how many Foot there is contained in the said Stone?

Reduce all the Dimensions into Inches, and divide by 1728.

Facit 70 *Foot* $\frac{5}{11}$.

How to measure Timber.

A Piece of Timber 20 Foot 8 Inches in length, 2 Foot 5 Inches broad, and 2 Foot thick; how many Foot doth it contain?

Facit 99 *Foot* $\frac{3}{5}$

A Country-man borrow'd of his Neighbour a Stack of Hay, the Content whereof was 40 Foot square:——When the time of Payment came, he told his Neighbour, he could not pay him all together, but he would pay him 20 Foot square at that time, and 20 Foot square more at another time afterwards, which he performed. The Question is, whether he paid the whole Quantity borrowed, or what was wanting thereof?

40

40	20
40	20
1600	400
40	20
64000 *borrowed.*	8000
	8000
	16000 *paid.*

So he paid but one quarter of the Quantity he borrowed.

There are many Things of this nature that might be brought in under these two Heads, which are more difficult; as the Measuring of Land of several Forms, and the Measuring of Timber, Stone, or other Things not equally squared; the well managing thereof would require a Treatise of it self, which I omit, in regard it doth not so much concern my Practice, nor my Intention in this Tract: but judge this sufficient for the present.

LAUS DEO.

FINIS.